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NATURAL RESOURCES AND PARKS

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**EXISTING COMBINED SEWER OVERFLOWS
for METRO's 5-YEAR CSO PLAN UPDATE**

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March 1994

Purpose

The purpose of this report is to present the combined sewer overflow (CSO) volume information upon which the decisions in the CSO Plan 5-Year Update will be made. The methodology used in the generation of the CSO information is also presented. The information comes from the knowledge of the existing and anticipated regulator control programs and the results of computer simulations of the West Division collection system. A description of the computer models used and the assumptions made during the simulations are also presented in this report.

Introduction

A good understanding of Metro's existing combined sewer overflows is needed in order to strategize the best ways to reduce the number and volume of overflows to local receiving waters. An enhanced understanding of the response of the collection system under storm conditions has been gained since Metro's 1988 Final Plan for CSO Control. This improved understanding has come as a result of one of the projects in the 1988 CSO Control Plan. Specifically, the CATAD Improvement project was intended to improve the control of the collection system to maximize utilization of available storage and treatment capacity. The control system (hardware and software) is referred to as CATAD (Computer Augmented Treatment and Disposal).

The CATAD Improvement project has been completed. The project involved developing a new Rainfall/Runoff model and a hydraulic routing model to better simulate the collection system. A Predictive Control program was written to improve the control of regulator gates and pumping stations by predicting the inflows due to rainfall that has already fallen and optimizing the usage of in-line storage and conveyance in the collection system. New level sensors and better flow calculations also resulted from the CATAD Improvement project. These tools and improved information have been used to project future CSOs as discussed in the following sections.

Model Development

Metro's Rainfall/Runoff model uses a kinematic wave approximation of the momentum equation to route flow due to rainfall overland and through the minor sewers. The development of the Rainfall/Runoff model included defining over 400 sub-basins in the West Division service area. Metro staff placed portable flowmeters at over 70 locations in the collection system to calibrate the model with respect to the basin parameters. The

Rainfall/Runoff model now simulates base flow, direct inflow during storm events, and infiltration into the pipes during and between storms.

METRO's fully dynamic hydraulic routing model (UNSTDY) was used to simulate the flows in METRO's trunks and interceptors. Some City of Seattle pipes are also included in the hydraulic routing model.

The hydraulic routing model solves the full hydraulic equations of continuity and momentum. Backwater, flow reversal, surcharged and open channel flow, and regulator and pump station operation, which are all key elements of the simulated flow during overflow events, are all simulated with this program. The model computes both flowrates and water surface levels throughout the collection system during each simulation. The local, old automatic, and new Predictive control capabilities were added to the hydraulic routing model to simulate the collection system response and to evaluate overflow events. Previous models for CSO planning only computed flowrates, and were limited in ability to simulate backwater effects and compute flow over weirs.

As new information is obtained from corrected level sensors, Metro's models will continue to be calibrated to match field measurements.

Baseline CATAD Inaccuracies

Computer Code

The model development necessitated investigation into the collection system and the previous control program. Part of the CATAD Improvement project money was used to translate computer code from assembly language used on the Sigma computer to FORTRAN, which is used on the MicroVAX II computers at West Point. The translation and testing of this code, and the calibration of the hydraulic routing model, brought to light some problems with the computer code as it was originally written.

Some pipe information was found to be erroneous in the CATAD database. Flow calculations were also found to need correction. The pipe information has been corrected and some of the flow calculations have been improved.

Level Sensors

Control of the regulator and pumping stations is based on levels of wastewater in the trunks and interceptors (and on flow calculations using the levels). It is, therefore, very important for the level sensors to be accurate in order for the control of the system to be effective. It is also necessary to have accurate level readings to accurately compute overflows from the system. Implementing the Predictive Control Program brought to light some problems with level sensors.

Although most outfall locations require structural improvements to reduce CSOs (e.g., storage or treatment facilities), some reduction in CSOs may be achieved merely by correcting level sensors.

Errors in the level sensor elevations caused some regulator and outfall gates to close sooner than necessary, and caused some to close later than intended. This, in turn, lead to increased overflows at some locations and reduced overflows at other locations. In addition, some of the overflow calculations were in error due to the fact that trunk levels and/or tidal levels were in error. These level sensor errors most likely existed during the baseline period (1981- 83), since they pertain to the "zero" elevations on the sensor, from which all depths are based.

During the summer of 1992, all of the West Division regulator and pump station trunk, interceptor, and wet well level sensors were checked to determine if the measured water surface elevation matched the Programmable Logic Controller (PLC) elevation and the elevation stored on the West Point computers. Thirty eight of the level sensors were off by 0.2 feet or more. Seventeen of them were more than 0.5 feet in error. A project was implemented to survey the stations where errors were detected and calibrate or repair the level sensors (mostly bubblers). Although this corrective work is still in progress, sixteen of the sensor errors were corrected in January of 1993 by adjusting the "zero" elevation on the meters. It is assumed that these zero elevations were in error from the first installation of the CATAD system.

A listing of the level sensors that were corrected in January, 1993 are presented in Table

Table 1
Level Sensor Errors Simulated in Hydraulic Model Simulations

<u>Level Sensor Location</u>	<u>Error Direction</u>	<u>Error Magnitude</u> (feet)
8th Ave.Reg. Trunk	Low	0.4
8th Ave. Reg. Tidal	High	0.95
Chelan Ave. Reg. Tidal	Low	0.34
Michigan Ave. Reg. Interc.	Low	0.69
Michigan Ave. Reg. Tidal	Low	0.4
Brandon Interceptor	Low	0.35
Hanford #2 Trunk	Low	0.6
Hanford #2 Tidal	Low	0.6
Hanford #2 Interceptor*	High	0.23
Dexter Ave. Trunk*	High	0.55
Connecticut Reg. Interc.	High	0.5
University Reg. Interc.	High	0.55
Montlake Reg. Interc.	High	0.55
Ballard Reg. Trunk	Low	0.44
Ballard Reg. Tidal	Low	0.23
Duwamish P. S. Wet Well	Low	0.25
Belvoir P. S. Wet Well	High	0.33
Hollywood P. S. Wet Well	Low	0.28

*These stations still require verification. The levels were adjusted in the model simulations.

1. Both the direction (whether the erroneous readings were low or high) and the magnitude of the error are shown in the table.

Several other level sensors are yet to be corrected. The additional sensors in the West Point service area that are known to need repair or re-calibration at this time are listed in Table 2. The exact problems with these sensors are unknown and, therefore, simulations could not be run to simulate "uncorrected" levels at these sites.

The unknown problems with these sensors make it difficult to exactly replicate overflow events in the baseline period using the Rainfall/Runoff and hydraulic routing models.

Table 2
Level Sensors Still to be Corrected

Chelan Ave. Regulator Interceptor	E. Marginal P.S. Wet Well
Denny Way Interceptor	Interbay P.S. Wet Well
Harbor Ave. Regulator Interceptor	W. Marginal Way P.S. Wet Well
Harbor Ave. Regulator Tidal	Montlake Regulator Trunk
King St. Regulator Interceptor	Lake City Regulator Trunk
King St. Regulator Tidal	Logboom Regulator -- all sensors
Lander #2 Regulator Interceptor	30th Ave. Pump Station Wet Well
Lander #2 Regulator Trunk	Woodinville P.S. Wet Well
S. Michigan St. Regulator Trunk	11th Ave. NW Level
W. Michigan St. Regulator Trunk	E. Pine Pump Station Wet Well

Control Issues

Regulator stations can be placed in Local or Automatic control. A regulator gate in Local control will direct flow to the interceptor as long as the flow depth in the interceptor is at or below a specified set point. A regulator gate in Automatic control will open and close according to a centralized control program which allocates flow from each station. In addition to the regulator stations, the Interbay Pump Station could also operate in either mode during the baseline years, affecting overflow volumes experienced along the Elliott Bay Interceptor and along the North Interceptor.

Most of the CATAD data tapes from the baseline years have been overwritten and the data is, therefore, no longer available. The control modes of each station and the recorded overflow hydrographs could not be obtained. These facts make it difficult to calibrate the models to exactly match the overflow volumes recorded at each overflow site.

Each design storm was first simulated with stations in Local mode. Then storms were simulated using Automatic control for stations which were most commonly put into Automatic control in the baseline years. None of the Northern Service Area stations were commonly in Automatic control mode. Most of the stations in the Southern Service Area

were commonly placed in Automatic Control. The exceptions were Norfolk and Hanford #1.

The overflow tables contained in this document reflect Interbay Pump Station in Local control, even for the "Auto" simulations. The simulated overflows at Interbay (interceptor overflow at Denny Way) matched much closer to the recorded volumes when the station was in Local control for the design storms. Therefore, it was assumed that the Interbay Pump Station was in Local control during the design storms.

CSO Baseline in 1988 Plan

SACRO Model

Annual overflow volumes in the Final 1988 Combined Sewer Overflow Control Plan were obtained using SACRO, a model used in the 1985 and 1988 CSO work. SACRO is a simplified simulation model which simulates the routing of flows through Metro's collection and conveyance system using only a mass balance on flow (the continuity equation). It uses flowrates as its only means of control and does not compute water surface elevations in pipes. SACRO computes overflow volumes by adding all inflows to a given location (regulator or pump station, etc.) and subtracting the estimated capacity of the pipes or pump station leaving that location.

Because it cannot explicitly account for the depth of flow upstream or downstream or for momentum effects, SACRO cannot provide highly accurate overflow estimates -- being high or low depending on the situation at each location. For example, SACRO predicted an overflow at the Duwamish Pump Station that does not, in fact, occur. The expected overflow at the Duwamish Pump Station may occur at upstream or downstream regulators which can be correctly predicted by Metro's hydraulic model. In addition, SACRO treated all locations as if they were in Local control.

Annualizing Factors

Annual CSO volumes were estimated using the same annualizing factors used in Metro's 1988 CSO Plan. These annualizing factors were estimates of the number of times per year that an overflow event near the size of each design storm would occur in the baseline period. Because storm rainfall volumes and intensities differed between the NSA and the SSA during the seven design storms, there is a different set of annualizing factors for the NSA and the SSA. The annualizing factors are shown in Table 3.

The estimated overflow volumes for each design storm are multiplied by the corresponding annualizing factors and added together to arrive at an estimate of annual overflow volume. For example, the overflow volume in the Northern Service Area (NSA) in storm #1 is multiplied by 0.99 and the overflow volume in the Southern Service Area (SSA) in storm #1 is multiplied by 1.16. The overflow volumes in the seven design storms are similarly multiplied by the corresponding annualizing factors. These factored volumes are summed to obtain an annual estimate of overflow volume.

Table 3
Annualizing Multipliers

Design Storm	Date	SSA Factor	NSA Factor
1	1/4/83	1.16	0.99
2	3/10/83	13.30	0.16
3	9/10/83	7.89	5.82
4	10/6/82	8.33	3.11
5	10/28/82	3.33	4.45
6	11/17/82	2.31	1.96
7	12/3/82	0.95	0.11

Computer Simulations of Baseline (1981-1983) Conditions

Metro's Rainfall/Runoff and hydraulic routing computer models were used to simulate the conditions as they were in the 1981-83 time frame. The incorrect levels that were verified and changed on the real system were used in the hydraulic model to simulate the conditions as they were when the level sensors produced erroneous output. These simulations using incorrect level information at the sites in Table 1 are hereafter referred to as "uncorrected level" simulations.

The seven design storms were simulated and the results were compared with the reported overflow volumes. The simulation outputs include both the volumes that overflow in the simulation, and the volumes that the CATAD system would have computed based on the simulated trunk elevations. In general, the CATAD-computed overflow volumes should match fairly well with the overflow volumes computed in the simulation with incorrect sensor information.

Some of the basin parameters in Metro's Rainfall/Runoff model were adjusted to achieve a better match with the reported overflows in the seven design storms. The computer models were then run again to simulate baseline conditions. A listing of the basin parameters for baseline conditions is contained in Table A-1 in the Appendix.

Computer Simulation Results for Baseline Conditions

The same annualizing factors used in the 1988 Final CSO Plan were used in this analysis to estimate annual overflow volumes from the seven design storms. The annualized estimates of overflow volumes from the simulations of the collection system using uncorrected level sensor information are shown in Table 4 for baseline conditions. The annualized CATAD-computed data presented in the table is the reported overflow volume (from CATAD) for each design storm annualized by using the same multipliers. The reported overflows and the simulation results for each of the design storms are shown in Table A-3 of the Appendix.

Overflow volumes differ according to whether stations were in Local or Auto mode, as is evident in Table 4. No information is available about the mode in which the stations were actually operating in the baseline period. This explains some of the differences between modeled results and reported overflows. The annualized overflow volumes for the common stations using Auto control are also shown in Table 4. In general, overflow volumes were higher in Auto control mode at 8th Ave., Chelan Ave., Hanford #2, and King St. regulators. The Denny Way/Lake Union overflow volumes were reduced significantly when the normal stations were in Auto control.

CATAD vs. Model Overflow Volumes in Computer Simulations

The computer simulations produce two sets of overflow information. One set is the model's best estimate of the overflow volumes, using information at many locations in the pipes. The second set of overflow volume numbers is what the CATAD flow calculations would have calculated using only the information at the locations in which there are bubblers in the field. Because the depth of water over an overflow weir may be different at the upstream and downstream ends, a calculation using only one measurement (such as CATAD does) is not as accurate as one using levels at both the upstream and downstream end of the weir (the hydraulic model's estimate). Therefore, for baseline conditions, the hydraulic model's calculation is the most accurate. The CATAD-computed values, however, are compared with the reported overflow volumes to match the similar overflow estimates.

The baseline information is presented along with the simulated overflow volumes in Table 4. Simulation results for using corrected levels are shown in Table A-3 in the Appendix. Corrected level sensors result in a decrease in overflow volumes at some locations and an increase in overflow volumes at others.

New Baseline Overflow Volumes

A new set of baseline overflow volumes is suggested in this document to give an updated estimation of what overflow volumes were actually occurring under baseline conditions. These new baseline volumes reflect the increase in knowledge gained since Metro's 1988 CSO Plan. The locations that were thought to be controlled to one event per year in the '88 CSO Plan are included in the new baseline volumes. The new overflow volume numbers also reflect the information gained from simulations of the collection system using uncorrected level sensor data. Recorded data as well as simulated data were used to derive the new baseline numbers.

Table 4 includes several stations which were previously thought to be controlled to one event per year, but for which recently acquired information indicates otherwise. These include the Martin Luther King Way overflow (MLK Way) near MLK Way and S. Henderson St., the S. Henderson St. Pump Station, the Alki system stations, the North Beach Pump Station, and the S. Magnolia overflow.

Table 4
1981-83 Annualized Overflow Volumes

Station	'88 CSO Plan Baseline (MG)	Annualized Volume Computed by CATAD (MG)	Simulation Results						New Baseline (MG)
			Local Ctrl. Uncorrected Levels Hyd. Model (MG)	Local Ctrl. Uncorrected Levels CATAD (MG)	Auto Ctrl. Uncorrected Levels Hyd. Model (MG)	Auto Ctrl. Uncorrected Levels CATAD (MG)			
SSA									
8th Ave.	15	10.2	11.5	10.0	26.4	22.1		15	
W. Michigan	2	2.3	0.0	0.0	0.0	0.0		2	
Harbor	55	48.1	57.9	0.0	57.9	0.0		55	
Chelan	25	37.0	107.2	95.9	161.5	151.4		110	
Norfolk	4	0.5	59.4	56.4	59.5	56.8		60	
Michigan	250	253.1	185.6	167.4	185.9	164.4		190	
Brandon	35	30.1	60.4	55.3	63.9	57.7		60	
Hanford #1		330.9	0.0	0.0	0.0	0.0			
Hanford #2		271.0	453.1	424.0	525.1	489.3			
(Total Hanford)	680	601.9	453.1	424.0	525.1	489.3		605	
Lander #1	215	187.4	130.9	220.8	126.7	212.4		190	
Connecticut	90	79.1	112.1	97.4	112.8	98.9		90	
King	70	52.7	20.8	26.6	60.5	75.9		55	
Denny Local		64.0	92.7	86.7	82.5	83.3			
Denny LKU		332.3	390.0	369.4	269.1	262.6			
Interbay		5.5	4.7	14.8	4.5	15.1			
(Total @ Denny)	370	401.8	487.4	470.9	356.1	361.0		405	
Duwamish P.S.	130	0.0	0.3	0.0	0.3	0.0		1	
MLK Way ^a			88.1		88.1			89	
Henderson St. P.S. ^{a,b}			25.7		25.7			26	
(MLK/Hend. Total)			113.8		113.8			115	
So. Magnolia ^{a,c}			5.4		5.4			5	
NSA									
Dexter	12	15.1	3.0	9.5	3.0	9.6		15	
Canal St.	10	0.0	0.6	0.7	0.6	1.7		1	
University	211	98.6	104.0	93.4	96.6	100.6		110	
Montlake	40	6.9	7.3	7.4	7.3	7.4		10	
Ballard Reg.		8.1	85.2	89.4	85.2	97.5			
11th Ave NW		0.0	3.6	0.0	3.5	0.0			
(Total Ballard)	90	8.1	88.8	89.4	88.7	97.5		90	
3rd Ave. W.	105	0.0	124.8	0.0	118.7	0.0		125	
N. Beach P.S. ^a			1.9		1.9			2	
Allki									
Murray P.S. ^a			5.1		5.1			5	
Barton P.S. ^a			6.7		6.7			7	
Beach Dr. ^a			11.7		11.7			12	
63rd Ave P.S. ^a			93.6		93.6			95	
(Total Alki)			117.1		117.1			117	
Total	2409	1833.1	2257.0	1825.0	2293.3	1906.7		2430	
Total @ CATAD	2117	1782.7	1828.6	1825.0	1871.1	1906.7			
Stations Only									

^a Stations not connected to CATAD and not examined in the 1988 CSO Plan.

^b Average of 1990-1993 recorded overflow volumes.

^c Average of 1989 -1993 recorded overflow volumes.

The new baseline annual volumes are shown in the last column in Table 4. The new volumes are notably reduced for University and Montlake Regulators and the Duwamish Pump Station. The net result of these reductions and the increases from the new locations examined recently is that the new baseline overflow volume is 2,430 million gallons, compared to the previous baseline volume of 2,409 million gallons.

Site-Specific Considerations

Ballard Regulator

The Ballard Regulator overflow volumes recorded on the CATAD system are in error for two reasons. First, the trunk bubbler was reading 0.44 feet too low. Overflows would have been occurring over the weir without any overflow volume being reported. Secondly, the bubbler is located at the downstream end of the overflow weir. When the weir was overflowing, the level at the downstream end would be significantly lower than the level at the upstream end, so even if the sensor was correct, the overflows would be underestimated. In the baseline period, a significant amount of flow would have been going over the weir before an overflow was recorded.

This scenario is illustrated by the graph in Figure 1 that shows flow through the regulator and overflow during the computer simulation of design storm #6. CATAD data indicates that the regulator gate was actually closed for 9 hours 50 minutes. The regulator flow

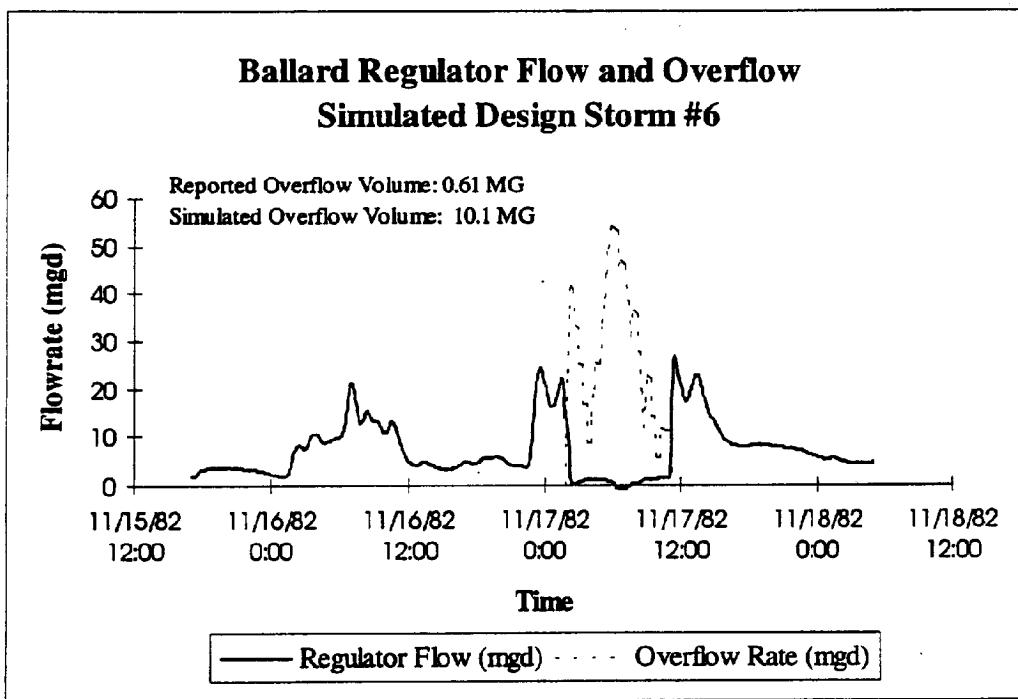


Figure 1

was 38 mgd just before the regulator gate closed. Only 0.61 million gallons was recorded as overflow by CATAD. The hydraulic model simulated the gate closed 9 hours 20 minutes with a regulator flow of 30 mgd just before it closed. About 10 million gallons of overflow was indicated by the model. It is quite apparent that the 0.61 million gallons recorded overflow is grossly underestimated. (The CATAD overflow computed by the hydraulic model used the elevation upstream of the overflow weir, which is why the CATAD overflow value in Table A-3 is not much lower.)

The invert elevation at the Ballard Interceptor bubbler was incorrect in the CATAD calculation software. It was about 2 feet higher than in reality. It is unknown whether the bubbler reading was off by the exact same amount as the invert elevation, but a flow test during West Point construction revealed that the bubbler reading at least 1.5 feet too high in July of 1990. The resulting flow calculation for the Ballard Interceptor may have been underestimated, as if the water level was one-half foot lower than it actually was. Interbay flows would not have been reduced as much as would have occurred if the invert and bubbler elevations had been correct.

Chelan Ave. Regulator

Since the 1988 CSO Plan, it was discovered that a City of Seattle overflow weir upstream of the Chelan Ave. Regulator was below the trunk set point at the regulator. The result was that a significant amount of flow was going over the City's weir that was not recorded. The City eliminated the overflow weir at that location in the early 1990's. The simulated results reflect the case where there is no city weir and all overflow is credited to Chelan Ave. Regulator. This explains why the new baseline overflow volume is much higher than the recorded volume and the '88 Plan baseline volume at Chelan Ave. Regulator.

Norfolk Regulator

The 4 million gallons of overflow at Norfolk Regulator in the 1988 CSO Plan baseline is inexplicably low. Overflow volumes in the last four wet seasons have averaged 67.2 million gallons per year. The new baseline of 60 million gallons/year seems to be in line with both model results and recent data.

Hanford #1 Regulator

The Hanford #1 Regulator was in operation until the Hanford/Lander Project was constructed in the late 1980's. It consisted of an outfall gate along the Hanford Trunk, about 5,000 feet upstream of the Hanford #2 Regulator Station. Normal operation of Hanford #1 and #2 would result in overflows primarily occurring at the Hanford #2 Regulator. Hanford #1 was mainly a "safety valve" to discharge flow if warranted. Exceptionally high tides are one reason that overflows might have occurred at Hanford #1 instead of #2, but a high tide could not have remained high enough to keep Hanford #2 closed for long storm events while CSOs were occurring at Hanford #1.

During several design storms, significant volumes of overflow were recorded at the Hanford #1 Regulator. Design storms 1, 2 and 3 recorded overflow at Hanford #1 and

not at Hanford #2. Storm 7 recorded more overflow at Hanford #1 than at Hanford #2. Incorrect level sensor information or malfunctioning of the Hanford #1 or #2 outfall gates could have caused the unusual behavior. Because these occurrences can not be explained, baseline conditions are difficult to reconstruct in simulations and, therefore, the annualized recorded volume was used as the new baseline number. These same difficulties were noted in the 1988 CSO Plan documentation.

Denny Way Regulators

A separate technical memorandum has been written documenting the overflow volumes from the Denny Regulator during the baseline period. Recent overflow volume information and comparisons to recorded overflow volumes are presented in the memorandum. The new baseline volume of 405 million gallons reflects the annualized overflow volume from the CATAD-reported data.

Duwamish Pump Station

The overflow into the Duwamish River at the inverted siphon is an unmeasured overflow location. The SACRO model projected an annual overflow volume of 130 million gallons per year at that location for the '88 CSO Plan. Current modeling efforts indicate that overflows occur there only in very large storms (much greater than a one-year storm) and that the average annual volume is less than 1 million gallons.

University Regulator

Overflows at the University Regulator were increased above the calculated overflow volumes in the '88 CSO Plan because it was thought that the regulator flow was being overestimated. Actually, the calculated regulator flow does not affect the overflow calculation, and the reported overflow volumes have been matched by the current modeling efforts. The new baseline estimate of 110 million gallons/year for overflows is based on the annualized volume derived from the seven design storms. It is significantly below the '88 CSO Plan baseline of 211 million gallons/year.

Montlake Regulator

The Montlake Regulator overflows also were increased above the annualized overflow volumes derived from the seven design storms in the '88 CSO Plan. The current modeling efforts result in an annual volume of 7.3 million gallons per year compared to an annualized value of 6.7 million gallons for the CATAD-reported data. Together, the new estimates for University and Montlake Regulators are about one-half of the 1988 CSO Plan estimate.

Alki system

Overflows in the Alki system were thought to be controlled to the one event per year level during the '85-'88 planning process. Since then, it has been discovered that there are several occurrences of overflow events each year in the Alki basin. The Alki basin has been modeled in this current CSO plan update, but there is little data available in the basin for calibration. Therefore, the annual and one-year volume estimates contained in

this memorandum are highly uncertain. Calibration work will proceed when good data is collected.

North Beach Pump Station

The North Beach Pump Station was also thought to have been controlled to a one event per year level during the '85-'88 planning process. The basin flows were investigated during the Carkeek Facilities Plan and during the North Beach Pump Station Upgrade Pre-Design Study. A calibrated model was developed and several years of rainfall was simulated. There is high confidence in the annual overflow volume estimate of 1.9 million gallons and the overflow frequency of 18 events per year.

So. Magnolia

Measured overflows between 1984 and 1988 were less than 0.1 million gallons per year. The average annual volume of overflow from 1989 through 1993 has been 5.2 million gallons. The level sensor was replaced in 1988 with a better meter. It is unclear if the higher overflow volumes being reported recently are merely the result of better information or whether something else has changed. There may be a restriction in the line there, since the modeling effort indicates that no overflows should be occurring. This site will be investigated further in the CSO Plan Update. For the suggested new baseline, the recent information of 5 million gallons/year is used.

Martin Luther King Way

Several large overflow events have occurred at the MLK Way overflow structure in recent years. In October, 1991, it was discovered that there was a partial blockage in the 18" line connecting it to the Henderson St. Trunk. The blockage was removed (on Oct. 11, 1991) and subsequent overflow volumes have been reduced, but are still significant. The new baseline number of 90 million gallons reflects the annualized overflow volume from simulating the seven design storms.

Henderson St. Pump Station

The average overflow volume recorded during the years 1990 - 1993 was 25.7 million gallons. (This did not include the large storm in January, 1990.) This overflow was also thought to have been controlled to a one event per year level in the '88 CSO Plan. Some investigation has been done pertaining to the operation of the pump station. The line between the overflow weir and the pump station was also cleaned. Overflows continue and appear to be due to excessive infiltration/inflow in the partially separated tributary area. For the purposes of a baseline overflow volume, 26 million gallons per year is used to reflect recent overflow data. The one year volume of 13.7 million gallons is the fourth largest overflow volume during the four years of record (1990-1993).

Modeling of 1996 Conditions

Metro CSO Control Project Status

Since the baseline years, several projects have been completed by Metro to reduce CSOs. Several more projects are being constructed and are scheduled to be on-line by the year 1996. The projects which have been completed are:

- Hanford/Lander Project - joint effort between Metro and the City of Seattle;
- University Regulator project, including removal of Densmore drain and Green Lake flows;
- Carkeek Transfer;
- Richmond Beach Flow Transfer;
- Parallel Fort Lawton Tunnel;
- CATAD modifications
 - Predictive Control Computer Program;
 - CSO mode at Interbay Pump Station;
 - Some bubbler corrections;
 - Flow calculation corrections.

The following projects are scheduled to be completed by the year 1996:

- Completion of bubbler repair;
- Ravenna Creek diversion to storm drain;
- Alki Transfer;
- Southern Transfer of Alki equivalent flows from the Norfolk Regulator to Renton;
- West Point Upgrade to secondary treatment and 440 mgd capacity;
- Interbay Pump Station Upgrade to 133 mgd;
- 96" trunk line in Royal Brougham Way;

All of these projects are included in the computer simulations of 1996 conditions. A listing of the basin parameters for 1996 conditions is contained in Table A-2 in the Appendix.

City of Seattle CSO Control Program

Between 1981 and the end of 1993, the City of Seattle constructed 29 storage projects, 4 storage and separation projects, and 6 stormwater separation projects. All but one of 29 storage projects are in basins that had stormwater separation done in the 1960s and the 1970s. A listing of these projects, which were included in the model simulations for 1996 conditions, are contained in Tables A-4 and A-5 in the Appendix.

Modeling Assumptions for 1996 Conditions

The seven design storms were simulated to estimate the annual overflow volumes remaining in the year 1996, and to estimate the volume associated with design storm #6 representing the one-year CSO event. Two different control assumptions were required for these simulations and are as follows:

- Case 1: Interbay would be allowed to pump up to 133 mgd without being restricted, and the West Division Treatment Facility at West Point would operate at 440 mgd as much as possible to minimize CSOs overall.
- Case 2: Interbay would be restricted such that flow to the West Division plant would seldom exceed 400 mgd. The Interbay Pump Station flow begins to be restricted when the West Point flow is about 350 mgd. West Point storm flows would generally peak about 400 mgd. The simulated peak flow at West Point is 429 mgd during the one-year storm under this control option and up to 440 mgd in the largest storm. This assumption reflects the concern of some Metro staff that allowing 440 mgd to flow to the plant might result in safety problems and/or bypass occurrences at the plant.

Both of these cases assume the Ballard Regulator gate will remain open during even the largest design storm. Overflows will still occur there due to capacity restrictions in the Ballard Siphon.

The annual overflow volumes expected in 1996 resulting from each scenario are presented in Table 5. The resulting annual overflow volume represents a reduction of between 34% and 37% from the 1981-83 baseline conditions, depending on which assumptions one makes about the operation of Interbay Pump Station.

It is to be noted that limiting Interbay Pump Station flow when flows are high in the North Interceptor will decrease annual overflows into the ship canal while increasing annual overflow volumes into Elliott Bay, with most of the increase occurring at Denny Way. The simulation of a restricted Interbay Pump Station flow in this report is only one option for control which may be available to West Point operations personnel. A further restriction of Interbay Pump Station flows to keep West Point flows always at or below 400 mgd would result in greater differences in CSO volumes than presented in Table 5.

The overflow volumes at each regulator station associated with design storm #6 (the one-year CSO event) are presented in Table 6. Again, at some stations, the overflow volume to be controlled to the one per year level somewhat depends on the control assumptions for Interbay Pump Station and the West Point plant. The overflow volumes associated with the two cases described above are given in Table 6 for reference.

Summary

The West Point collection system has been carefully modeled using Metro's Rainfall/Runoff and hydraulic routing computer models. Simulations were run for seven historical design storm events from the baseline (1981-1983) period and compared with the reported overflow volumes on the CATAD system. Level sensors that have been found to be in error were simulated in their uncorrected condition to match as closely as possible to the reported data. Information on what stations were in Auto or Local control during the design storms is no longer available, which complicates the calibration process

Overflow Location	<u>Interbay Pump Station</u>		
	Unrestricted	Restricted	Difference (MG)
	WP 440 (MG)	WP 400 (MG)	
SSA			
8th Ave.	12	12	0
W. Michigan St.	2	2	0
Harbor Ave.	58	58	0
Chelan Ave.	93	93	0
Norfolk St.	5	5	0
Michigan St.	173	173	0
Brandon St.	57	57	0
Hanford #2	202	207	6
Lander #2	161	164	3
Connecticut St.	91	93	2
King St.	23	33	10
Denny Local	79	82	3
Denny Lake Union	265	270	6
Interbay @ Denny	8	103	94
(Total @ Denny)	352	455	0
MLK Way	88	88	0
Henderson St. P.S. ¹	26	26	0
(Total MLK/Hend.)	114	114	0
Duwamish P.S.	1	1	0
S. Magnolia ³	5	5	0
NSA			
Dexter Ave.	15	15	0
Canal Street	0	0	0
University	58	48	-10
Montlake	4	4	0
Ballard Reg.	4	1	-2
11th Ave. NW	18	16	-2
(Total Ballard)			0
3rd Ave. W	51	33	-18
North Beach P.S.	2	2	0
Alki			
Murray P.S. ²	5	5	0
Barton P.S. ²	7	7	0
Alki-Beach Dr. ²	12	12	0
(Total Alki)	24	24	0
NSA Total	151	118	-33
SSA Total (incl. Alki)	1373	1496	124
Total (MG)	1524	1615	91

¹ Average measured annual overflow 1990-1993.

² The Alki basin flows have not been monitored, so calibration has not been completed for these overflow locations.

³ Average measured annual overflow 1989-1993.

Table 6		
Overflow Volume Remaining in the One-year Storm in 1996		
Station	(MG)	
WP 440	WP 400	
SSA		
8th Ave.	0.9	0.9
W. Michigan St.	0.1	0.1
Harbor Ave.	3.4	3.4
Chelan Ave.	6.2	6.0
Norfolk St.	0.4	0.4
Michigan St.	13.1	13.1
Brandon St.	4.5	4.5
Hanford #2	18.5	18.8
Lander #2	15.0	15.2
Connecticut St.	9.1	9.2
King St.	1.6	2.2
Denny Local	5.7	6.6
Denny Lake Union	22.7	23.0
Interbay @ Denny	0.1	5.5
(Total @ Denny)	28.5	35.1
MLK Way	6.2	6.2
Henderson St. P.S.	13.7	13.7
(Total MLK/Hend.)	19.9	19.9
Duwamish P.S.	0.0	0.0
S. Magnolia	1.3	1.3
NSA		
Dexter Ave.	0.5	0.5
Canal Street	0.0	0.0
University	6.6	5.7
Montlake	0.8	0.8
Ballard Reg.	0.4	0.1
11th Ave. NW	1.7	1.5
(Total Ballard)	2.1	1.6
3rd Ave. W	5.5	3.7
North Beach P.S.	0.5	0.5
Alki		
Murray P.S.	0.6	0.6
Barton P.S.	0.6	0.6
Alki-Beach Dr.	0.7	0.7
63rd Ave. P.S.	0	0
(Total Alki)	1.9	1.9
Total (MG)	144.7	149.3

of the baseline period. Simulations were made with stations in both Local control and Auto control to bracket the estimated overflow volumes that would have been expected. There is generally a good match between the reported overflow volumes and the simulated overflow volumes. The exceptions have been detailed in this report.

The computer models were also run to simulate conditions as they are expected to be in 1996, when the West Point upgrade and the Alki and Southern Transfers are expected to be complete. City of Seattle CSO projects as well as Metro projects constructed since the baseline period were incorporated into the computer models.

It is expected that the Metro CSO volumes will have been reduced by between 34% and 37% from the baseline annual volumes by the year 1996, depending on whether the Interbay Pump Station restricts flow to the treatment facility at West Point to about 400 mgd. Included in these annual estimates are the overflows which were thought to have been controlled to the one event per year level in the 1988 CSO Control Plan, but have been shown by flow monitors to occur more frequently.

TABLE A-1

Baseline Runoff Basin Parameters												
Stations and Trunks	Basin ID	Size (acres)	ADWF (%)	% Imperv.	Imp. Acres	% Conn.	Conn. Perv.	% Conn. Perv.	Conn. Width (ft.)	Leakage (psf)	Basin Manning's N	
N Interceptor	124	96.1	1700	40	38.44	30	11.532	0	400	9600	0.295	
N Interceptor	125	34.2	1650	49	16.758	30	5.0274	0	400	6120	0.325	
N Interceptor	126	70.9	1350	40	28.36	30	6.508	0	400	12080	0.325	
N Interceptor	127	26.2	700	22	5.764	30	1.729	0	400	5400	0.31	
N Interceptor	128	172.5	790	25	43.125	100	43.125	100	129.38	400	31660	0.292
N Interceptor	129	44.7	860	21	9.387	100	9.387	100	35.313	400	8550	0.35
N Interceptor	130	62.7	840	20	12.54	100	12.54	100	50.16	400	7480	0.295
N Interceptor	131	68.7	2000	23	15.801	100	15.801	100	52.899	400	11780	0.323
N Interceptor	132	170	780	23	39.1	100	39.1	100	130.9	400	22460	0.325
N Interceptor	133	200	1260	35	70	65	45.5	50	65	400	30550	0.3
N Interceptor	134	148.4	1030	38	56.392	30	16.916	0	0	400	24550	0.293
N Interceptor	135	249	1000	33	115.17	30	34.651	0	400	60550	0.32	
N Interceptor	136	39.2	1600	53	20.776	100	20.776	100	18.424	400	5830	0.083
N Interceptor	137	24.2	1850	38	6.166	30	2.7588	0	0	400	4400	0.204
N Interceptor	138	72.7	850	26	18.902	100	18.902	100	53.798	400	16000	0.31
N Interceptor	139	51.4	1120	28	14.392	100	14.392	100	37.008	400	31077	0.087
N Interceptor	140	310.6	1000	27	33.862	75	62.887	70	158.72	400	47600	0.309
N Interceptor	141	124.2	740	16	19.872	100	19.872	100	104.33	400	17250	0.348
N Interceptor	142	203.3	950	28	36.924	100	36.924	100	146.38	400	7020	0.325
N Interceptor	143	132.9	830	21	27.908	66	24.002	80	83.983	400	26600	0.325
N Interceptor	144	42.4	1640	53	22.472	100	22.472	100	19.928	400	5490	0.211
N Interceptor	145	278.6	700	15	41.79	80	33.432	80	189.15	400	38600	0.343
N Interceptor	146	40.7	1360	33	13.431	100	13.431	100	27.268	400	3600	0.217
N Interceptor	147	267.3	610	18	48.114	100	48.114	100	219.19	400	40150	0.355
N Interceptor	148	175.3	780	18	31.554	65	20.51	50	71.813	400	32200	0.34
N Interceptor	149	324	600	63.2	28.882	37	10.886	10	1.6818	400	5826	0.345
N Interceptor	150	41.9	1600	37.7	18.058	37	6.6816	10	2.9812	400	9729	0.34
N Interceptor	151	150.0	612	49.198	30	14.741	0	0	400	19700	0.32	
N Interceptor	152	182.1	520	10.6	19.303	30	5.7508	0	0	400	24800	0.395
N Interceptor	153	253.3	460	20.9	52.94	30	15.882	0	0	400	28800	0.32
N Interceptor	154	389	480	13.5	7.506	30	2.2518	0	0	400	8900	0.305
Subtotal		3,810		1,036	64	656	56	1,569				
Ballard R.S.	1	223.9	760	25	55.975	100	55.975	100	167.93	400	39820	0.35
Ballard R.S.	2	238.9	820	25	59.225	100	59.225	100	177.88	400	44801	0.35
Ballard R.S.	3	222.4	780	21	46.704	100	46.704	100	175.7	400	47840	0.35
Ballard R.S.	4	338.7	1010	35	87.985	30	26.387	100	265.99	400	48050	0.35
Ballard R.S.	5	341.4	630	21	22.705	100	20.707	100	1.08	400	58150	0.35
Ballard R.S.	6	138.7	630	24	33.288	30	9.9864	0	400	24100	0.03	
Ballard R.S.	7	46.8	600	21	9.638	30	2.9484	0	0	400	7750	0.35
Ballard R.S.	8	47.7	620	24	11.448	30	3.4344	0	0	400	10300	0.35
Ballard R.S.	9	251.3	1010	35	87.985	30	26.387	0	0	400	50280	0.33
Ballard R.S.	10	97.7	1050	41	40.057	30	12.017	0	0	400	6200	0.2
Ballard R.S.	11	32.8	2000	44	14.432	30	4.3296	0	0	400	13950	0.03
Ballard R.S.	12	263.5	910	27	71.145	30	21.344	0	0	400	40860	0.35
Ballard R.S.	13	115	1600	49	56.35	30	16.905	0	0	400	20280	0.03
Ballard R.S.	14	50.7	940	23	11.661	30	3.983	0	0	400	8760	0.35
Ballard R.S.	15	78.3	900	27	21.141	30	6.3423	0	0	400	13950	0.03
Subtotal		2,484		665	62	415	58	1,054				
Central Trunk	157	30.3	400	13	3.999	100	3.999	100	26.361	400	5900	0.325
Central Trunk	158	158	400	24	13.92	100	13.92	100	44.08	400	7300	0.26

TABLE A-1																				
Baseline Runoff Basin Parameters																				
Stations and Trucks	Basin ID	Size (acres)	ADWF %	% Imperv. (grade)	% Conn. Imperv.	% Conn. Imperv. Acres	% Conn. Imperv. Ac.	Conn. Imperv.	Conn. Imperv. Ac.											
Central Trunk	159	41	53	24.91	100	2,91	100	22.08	400	9400	0.298	0.067	0.25	0.02	20	3	9	11		
Central Trunk	168	97.2	780	23	22.356	100	74.844	400	13400	0.34	0.067	0.25	0.02	5	9	11	0	0.22		
Central Trunk	167	169.8	980	26	44.148	100	44.148	100	125.65	400	23500	0.348	0.067	0.25	2	10	9	11	0	
Central Trunk	168	173	850	24	41.52	100	41.52	100	131.48	400	23600	0.348	0.067	0.25	3	9	11	12	0.34	
Central Trunk	169	14	990	34	4.76	100	4.76	100	9.24	400	18500	0.215	0.067	0.25	30	3	9	9	0	
Central Trunk	174	86	930	26	22.36	100	22.36	100	63.64	400	14600	0.348	0.067	0.25	1	10	3	9	11	
Subtotal		675																		
Dexter RS	160	60	1,160	40	32	100	32	100	48	400	11800	0.32	0.067	0.25	15	5	11	0	0	
Dexter RS	161	101	1,280	43	43.43	100	43.43	100	51.57	400	13800	0.325	0.067	0.25	7	5	11	0	0	
Dexter RS	162	196.8	1,280	38	74.784	100	74.784	100	122.02	400	27000	0.31	0.067	0.25	3	10	11	11	0	
Dexter RS	163	63	890	62	3.906	100	3.906	100	2.394	400	850	0.335	0.067	0.25	0.02	20	11	0	1	
Dexter RS	164	11	1,400	83	9.13	100	9.13	100	1.87	400	22000	0.335	0.067	0.25	0.02	20	11	0	1	
Dexter RS	165	30	1,000	88	26.4	100	26.4	100	3.6	400	9000	0.1	0.067	0.25	0.02	20	11	0	0	
Dexter RS	170	34	1,920	78	28.52	100	28.52	100	7.48	400	6800	0.1	0.067	0.25	12	7	11	0	1	
Dexter RS	171	34	1,600	83	28.22	100	28.22	100	5.78	400	6300	0.1	0.067	0.25	2	6	11	20	0	
Dexter RS	172	77	1,400	67	51.59	100	51.59	100	25.41	400	13000	0.35	0.067	0.25	0.02	20	11	0	1	
Dexter RS	173	39	800	90	35.1	100	35.1	100	3.9	400	6800	0.1	0.067	0.25	0.02	20	11	0	0.22	
Dexter RS	193	12	1,000	88	10.56	100	10.56	100	1.44	400	1800	0.1	0.067	0.25	0.02	20	11	0	1	
Subtotal		621			342	100	342	100	279											
Monilake RS	98	130	820	22	28.6	30	8.58	0	0	400	24900	0.34	0.067	0.25	25	4	20	0	0	
Monilake RS	100	77	770	20	15.4	30	4.62	0	0	400	14500	0.34	0.067	0.25	15	8	20	0	0	
Monilake RS	101	27	890	11	2.97	30	0.891	0	0	400	5600	0.335	0.067	0.25	0.02	20	20	0	0	
Monilake RS	103	158	820	25	39.75	30	11.925	0	0	400	26400	0.35	0.067	0.25	10	6	20	0	1	
Monilake RS	104	241	850	24	57.84	79	45.894	70	128.21	400	39500	0.35	0.067	0.25	5	5	20	0	0	
Monilake RS	105	78	800	10	7.4	30	2.34	0	0	400	9400	0.335	0.067	0.25	0.02	20	3	20	0	
Monilake RS	106	167	590	9	13.23	30	3.959	0	0	400	21400	0.335	0.067	0.25	25	4	20	0	0	
Monilake RS	108	138	710	17	23.46	100	23.46	100	114.54	400	21100	0.335	0.067	0.25	0.02	20	3	20	0	0
Monilake RS	110	28	600	17	4.76	100	4.76	100	23.24	400	3000	0.32	0.067	0.25	0.04	5	20	0	1	
Monilake RS	111	69.4	700	18	12.492	100	12.492	100	56.908	400	10300	0.335	0.067	0.25	0.02	20	3	0	1	
Monilake RS	112	209	640	18	37.62	100	37.62	100	171.38	400	34800	0.34	0.067	0.25	0.02	5	3	0	1	
Monilake RS	113	246	400	13	31.98	100	31.98	100	214.02	400	33000	0.33	0.067	0.25	1	5	3	0	0.29	
Monilake RS	114	89	730	20	17	30	5.1	0	0	400	14400	0.335	0.067	0.25	0.02	20	3	20	0	
Monilake RS	115	42	590	15	6.3	100	6.3	100	35.7	400	7000	0.33	0.067	0.25	0.02	5	3	20	0	
Monilake RS	116	26	890	21	5.46	100	5.46	100	20.54	400	4800	0.35	0.067	0.25	0.02	5	3	0	1	
Monilake RS	117	152	920	22	3.344	100	3.344	100	11.886	400	1700	0.35	0.067	0.25	0.02	5	3	0	1	
Monilake RS	118	10.9	800	21	2.268	100	2.268	100	8.611	400	2400	0.335	0.067	0.25	0.02	5	3	0	1	
Monilake RS	119	81	380	12	9.72	100	9.72	100	71.28	400	17000	0.335	0.067	0.25	0.02	5	3	0	1	
Monilake RS	402	490.7	0	24	117.77	70	82.38	100	372.93	400	60000	0.33	0.067	0.25	5	5	20	0	1	
Subtotal		1,610			320	85	303	83	1,229											
E Lee PS	102	47	750	15	6.1	30	1.89	0	0	400	4200	0.335	0.067	0.25	0.02	20	20	0	1	
E Lee PS	106	61	890	20	12.2	30	3.68	0	0	400	10800	0.32	0.067	0.25	0.02	20	3	20	0	
E Lee PS	107	132	910	25	33	30	9.9	0	0	400	21500	0.35	0.067	0.25	0.02	20	3	0	1	
Subtotal		235			52	30	15	0	0											
E Pine PS	96	113	480	11	12.43	30	3.729	0	0	400	17100	0.33	0.067	0.25	0.02	20	18	20	0	
E Pine PS	97	118	490	15	17.7	30	5.31	0	0	400	20900	0.32	0.067	0.25	0.04	18	20	0	0	
Subtotal		235			52	30	17	0	0											
E Pine PS	98	77	600	14	10.78	30	3.234	0	0	400	21100	0.335	0.067	0.25	0.06	18	20	0	0	
E Pine PS	120	59	890	21	12.39	30	3.717	0	0	400	24500	0.34	0.067	0.25	1	7	20	0	1	
Subtotal		367			53	30	17	0	0											

Stations and Trunks	Basin ID	Size (acres)	ADWF (gpad)	% Imperv.	Imp. Acres	% Conn Imperv.	Conn. Imp. Ac.	% Conn Perv.	Conn. Perv. Ac.	Leakage (gpad)	Basin Width (ft.)	Mannings Perv.	Detention Imperv. (in.)	Detention Perv. (in.)	Soil Perm (in./hr.)	Suction Head (in.)	Rain Gauges:					
																	RG1	RG2	RG3	THEIS1	THEIS2	THEIS3
Univ. R.S.	16	243	600	20	48.6	5	2.43	0	0	400	35850	0.35	0.067	0.25	0.02	20	1	0	0	1	0	0
Univ. R.S.	17	201.1	600	33	66.363	5	3.3182	0	0	400	23950	0.33	0.067	0.25	0.02	20	1	0	0	1	0	0
Univ. R.S.	18	110.4	600	28	32.018	5	1.6006	0	0	400	12100	0.3	0.067	0.25	0.06	19	1	0	0	1	0	0
Univ. R.S.	19	91.7	500	11	10.067	5	0.5044	0	0	400	12350	0.345	0.067	0.25	0.02	20	1	0	0	1	0	0
Univ. R.S.	20	234.2	500	28	65.576	5	3.2788	0	0	400	27250	0.32	0.067	0.25	0.02	20	8	1	0	0	1	0
Univ. R.S.	21	169	500	20	33.8	0	0	0	0	400	24280	0.34	0.067	0.25	0.05	5	1	0	0	1	0	0
Univ. R.S.	22	152	490	21	31.92	0	0	0	0	400	15030	0.343	0.067	0.25	0.10	5	1	0	0	1	0	0
Univ. R.S.	23	170.6	500	33	56.298	0	0	0	0	400	23550	0.345	0.067	0.25	0.02	20	1	4	0	0.04	0.96	0
Univ. R.S.	24	324.7	960	24.5	79.552	86	68.414	80	198.12	400	54650	0.348	0.067	0.25	0.02	20	4	7	9	0.49	0.19	0.32
Univ. R.S.	25	257.5	680	23	59.225	100	59.225	100	198.28	400	33500	0.33	0.067	0.25	0.02	20	4	0	0	1	0	0
Univ. R.S.	26	186.2	880	26	48.932	100	48.932	100	139.27	400	31100	0.335	0.03	0.25	0.02	20	4	0	0	1	0	0
Univ. R.S.	27	382.1	2000	30	108.63	100	108.63	100	253.47	400	43000	0.335	0.02	0.25	0.02	20	9	0	0	1	0	0
Univ. R.S.	28	68.8	600	30	20.64	0	0	0	0	400	11670	0.325	0.067	0.25	0.02	20	1	4	7	0.22	0.25	0.53
Univ. R.S.	29	145	750	25	35.5	100	36.5	100	109.5	400	22150	0.34	0.067	0.25	0.02	20	9	0	0	1	0	0
Univ. R.S.	30	263.7	600	17	44.829	100	44.829	100	218.87	400	38000	0.315	0.067	0.25	0.02	20	3	4	9	0.01	0.1	0.89
Univ. R.S.	31	113.6	900	22.4	25.448	100	25.446	100	88.154	400	17200	0.333	0.067	0.25	0.02	20	4	9	0	0.93	0.07	0
Univ. R.S.	32	203.1	800	23	46.713	100	46.713	100	156.39	400	35100	0.345	0.03	0.25	0.02	20	4	0	0	1	0	0
Univ. R.S.	33	269.4	780	20	53.88	100	53.88	100	215.52	9800	39500	0.34	0.067	0.25	0.2	16	3	4	0	0.36	0.64	0
Univ. R.S.	34	109.7	740	21	23.037	100	23.037	100	66.663	400	20400	0.31	0.067	0.25	0.02	20	3	4	9	0.36	0.09	0.56
Univ. R.S.	35	73	0	96	69.35	100	69.35	100	3.65	400	7800	0.2	0.01	0.25	0.02	20	4	0	0	1	0	0
Univ. R.S.	78	253.7	680	25	63.425	100	63.425	100	190.26	400	42600	0.32	0.01	0.25	1	8	3	4	0	0.06	0.94	0
Univ. R.S.	84	148.4	770	22	32.648	100	32.648	100	115.75	400	25600	0.348	0.067	0.25	0.02	20	3	4	0	0	0.4	0
Univ. R.S.	121	61.5	1020	32	19.68	100	19.68	100	41.82	400	9400	0.345	0.067	0.25	0.02	20	3	0	0	1	0	0
Univ. R.S.	122	10.2	1000	34	3.468	100	3.468	100	6.732	400	3050	0.35	0.067	0.25	0.02	20	3	0	0	1	0	0
Univ. R.S.	123	66.3	1200	42	27.846	100	27.846	100	38.454	400	11200	0.335	0.067	0.25	0.02	20	3	0	0	1	0	0
Univ. R.S.	321	53.5	800	37.2	19.902	79	15.723	70	23.519	400	6314	0.335	0.067	0.25	0.02	20	3	0	0	1	0	0
Univ. R.S.	322	46.7	1200	24.5	11.442	51	5.6352	30	10.578	400	8840	0.34	0.067	0.25	0.02	20	3	0	0	1	0	0
Univ. R.S.	323	49.8	1200	29.5	14.691	72	10.578	60	21.065	400	9700	0.325	0.067	0.25	0.02	20	3	0	0	1	0	0
Univ. R.S.	396	78	830	24.5	19.11	100	19.11	100	58.89	400	10800	0.315	0.067	0.25	0.02	20	4	0	0	1	0	0
Univ. R.S.	403	285.7	0	25	71.425	100	71.425	100	214.28	400	4200	0.32	0.067	0.25	0.02	10	5	1	0	0	1	0
Univ. R.S.	404	488.7	0	28	136.84	100	136.84	100	351.86	400	37000	0.33	0.067	0.25	0.2	10	1	4	7	0.36	0.52	0.12
Univ. R.S.	405	276	0	92	253.92	100	253.92	100	22.08	11700	3300	0.33	0.01	0.25	0.02	20	4	9	0	0.3	0.7	0
		Subtotal			4,520		1,428	88	1,257	82	2,761											
30th Ave. P.S.	81	275.3	770	25	68.825	35	24.069	0	0	400	47780	0.337	0.067	0.25	0.7	12	2	4	0	0.88	0.13	0
30th Ave. P.S.	82	186.9	760	25	46.725	35	16.354	0	0	400	34280	0.32	0.067	0.25	0.04	19	2	0	0	1	0	0
30th Ave. P.S.	85	142.6	520	15	21.39	65	13.904	50	60.605	400	20580	0.35	0.067	0.25	0.02	20	3	0	0	1	0	0
30th Ave. P.S.	86	153.1	1300	34	52.054	30	15.618	0	0	400	21700	0.32	0.067	0.25	0.02	20	2	3	0	0.06	0.94	0
30th Ave. P.S.	87	81.5	1050	62	50.53	30	15.159	0	0	400	6900	0.35	0.067	0.25	0.02	20	3	0	0	1	0	0
30th Ave. P.S.	88	155.1	810	26	40.326	35	14.114	0	0	400	26320	0.35	0.067	0.25	0.02	20	2	3	4	0.75	0.23	0.02
30th Ave. P.S.	89	101.4	810	26	26.364	35	9.2274	0	0	400	17200	0.348	0.067	0.25	0.02	20	2	0	0	1	0	0
30th Ave. P.S.	91	70.6	640	17	12.002	30	3.6006	0	0	400	13000	0.34	0.067	0.25	0.02	20	3	0	0	1	0	0
		Subtotal			1,167		318	35	112	7	61											
Belvoir P.S.	83	223.4	650	25	55.85	30	16.755	0	0	400	20000	0.35	0.02	0.25	0.02	20	2	0	0	1	0	0
Belvoir P.S.	90	363.1	700	33	119.82	30	35.947	0	0	400	20000	0.348	0.02	0.25	0.05	17	2	3	0	0.91	0.09	0
Belvoir P.S.	92	83.7	800	16	13.392	30	4.0176	0	0	400	16650	0.35	0.067	0.25	0.02	20	3	0	0	1	0	0
Belvoir P.S.	93	111.2	800	21	23.352	30	7.0056	0	0	400	17650	0.35	0.067	0.25	0.02	20	3	0	0	1	0	0
Belvoir P.S.	94	81.3	700	20	16.26	30	4.878	0	0	400	10550	0.33	0.067	0.25	0.02	20	2	3	0	0.09	0.91	0
Belvoir P.S.	95	27.4	720	10	2.74	30	0.822	0	0	400	5500	0.34	0.067	0.25	0.02	20	3	0	0	1	0	0
		Subtotal			890		231	30	69	0	0											

TABLE A-1

Baseline Runoff Basin Parameters

Stations and Trunks	Basin ID	Size (acres)	ADWF (gpad)	% Imperv.	Imp. Acres	% Conn. Imperv.	Conn. Imp. Ac.	% Conn. Perv.	Perv. Ac.	Conn. Perv. Ac.	Leakage (gpad)	Basin Width (ft.)	Mannings Perv.	Detention Imperv. (in.)	Detention Perv. (in.)	Soil Perm (in./hr.)	Suction Head (in.)	Rain Gauges:			THEIS1	THEIS2	THEIS3
																		RG1					
Lake City T.	77	95.9	870	22	21.098	100	21.098	100	74.802	400	14000	0.32	0.067	0.25	0.02	20	4	0	0	1	0	0	
Lake City T.	79	240.4	840	20	48.08	100	48.08	100	192.32	400	39150	0.322	0.067	0.25	5	4	0	0	1	0	0		
Lake City T.	80	81.8	770	22	17.996	100	17.996	100	63.804	400	15920	0.322	0.067	0.25	4	8	4	0	0	1	0	0	
Subtotal		418			87	100	87	100	331														
Matt Park P.S.	36	331.1	632	10	33.11	14	4.6354	20	59.598	544.1	37690	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	37	288.4	632	10	28.84	14	4.0378	20	51.912	544.1	41050	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	38	103.2	632	9	9.268	14	1.3003	20	18.782	544.1	8760	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	39	212.7	632	9	19.143	14	2.68	20	38.711	544.1	31370	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	40	162.2	632	10	16.22	14	2.2708	20	29.196	544.1	23350	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	41	344.9	632	14	48.266	14	6.76	20	59.323	544.1	46450	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	42	98.6	632	13	12.558	14	1.7581	20	16.808	544.1	17520	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	43	224.8	632	30	67.44	14	9.4416	20	31.472	544.1	13860	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	44	132.4	632	38	50.312	14	7.0437	20	16.418	544.1	15200	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	45	164.9	632	10	16.49	14	2.3068	20	29.682	816.1	19200	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	46	132.4	632	25	33.1	14	4.634	20	19.86	544.1	16060	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	47	277.4	632	10	27.74	14	3.8836	20	49.932	544.1	39380	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	48	120.7	632	12	14.484	14	2.0278	20	21.243	544.1	14110	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	49	348.2	632	12	41.784	14	5.0496	20	61.263	544.1	39550	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	50	288.8	632	20	57.76	14	6.0864	20	46.208	816.1	36000	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	51	190.1	632	11	20.911	14	2.9275	20	33.638	188.1	32200	0.35	0.09	0.01	0.175	0.03	1	2	4	0.69	0.03	0.08	
Matt Park P.S.	52	232.4	632	19	44.156	14	6.1818	20	37.649	816.1	37500	0.35	0.09	0.01	0.175	0.03	1	2	0	0.79	0.21	0	
Matt Park P.S.	53	104.1	632	25	26.025	14	3.6435	20	15.615	816.1	17450	0.35	0.09	0.01	0.175	0.03	1	2	0	0.94	0.06	0	
Matt Park P.S.	54	317.1	632	21	66.591	14	9.3227	20	50.102	816.1	42200	0.35	0.09	0.01	0.175	0.03	1	2	0	0.23	0.77	0	
Matt Park P.S.	55	146.6	632	11	16.126	14	2.2576	20	26.095	544.1	14950	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	56	333.1	632	22	73.282	14	10.259	20	51.964	816.1	48800	0.35	0.09	0.01	0.175	0.03	1	2	0	0.85	0.05	0	
Matt Park P.S.	57	131.2	632	21	27.552	14	3.8573	20	20.73	816.1	24930	0.35	0.09	0.01	0.175	0.03	4	0	0	1	0	0	
Matt Park P.S.	58	149.9	632	14	20.986	14	2.638	20	25.783	544.1	27600	0.35	0.09	0.01	0.175	0.03	1	2	4	0.38	0.17	0.45	
Matt Park P.S.	59	134.7	632	14	18.658	14	2.6401	20	23.168	188.1	21530	0.35	0.09	0.01	0.175	0.03	2	4	0	0.98	0.02	0	
Matt Park P.S.	60	168	632	10	16.6	14	2.324	20	29.88	816.1	31000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0	
Matt Park P.S.	61	169.9	632	28	44.174	14	6.1844	20	25.145	544.1	21460	0.35	0.09	0.01	0.175	0.03	1	4	0	0.55	0.45	0	
Matt Park P.S.	62	331	632	44	145.84	14	20.39	20	37.072	544.1	42120	0.35	0.09	0.01	0.175	0.03	1	4	0	0.14	0.86	0	
Matt Park P.S.	63	287.9	632	17	48.943	14	6.852	20	47.791	816.1	57550	0.35	0.09	0.01	0.175	0.03	1	2	4	0.01	0.98	0.02	
Matt Park P.S.	64	214.4	632	13	27.672	14	3.9021	20	37.306	816.1	22300	0.35	0.09	0.01	0.175	0.03	2	4	0	0.62	0.38	0	
Matt Park P.S.	65	108.7	632	12	13.044	14	1.8262	20	19.131	816.1	19700	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0	
Matt Park P.S.	66	273.1	632	10	27.31	14	3.8234	20	49.158	816.1	40850	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0	
Matt Park P.S.	67	169.9	632	21	35.679	14	4.9951	20	26.844	816.1	30000	0.35	0.09	0.01	0.175	0.03	2	4	0	0.16	0.84	0	
Matt Park P.S.	68	207.2	632	18	37.296	14	5.2214	20	33.981	188.1	29600	0.35	0.09	0.01	0.175	0.03	2	4	0	0.00	0.01	0	
Matt Park P.S.	69	13.4	632	10	1.34	14	0.1876	20	2.412	188.1	3200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0	
Matt Park P.S.	70	87.9	632	20	17.58	0.5	0.0879	0	0	448	13200	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	71	219.8	632	12	26.376	0.5	0.1319	0	0	448	31120	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	72	128.8	632	17	21.556	0.5	0.1078	0	0	448	27850	0.35	0.09	0.01	0.175	0.03	1	2	0	0	1	0	
Matt Park P.S.	73	98.4	632	9	8.856	0.5	0.0443	0	0	448	17860	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0	
Matt Park P.S.	74	104.8	632	10	10.48	0.5	0.0524	0	0	448	22500	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0	
Matt Park P.S.	75	86.2	632	10	8.62	0.5	0.0431	0	0	448	19450	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0	
Matt Park P.S.	76	154.8	632	12	18.576	0.5	0.0929	0	0	448	23650	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0	
Matt Park P.S.	336	612	562	13.4	82.008	0.5	0.41	0	0	358.4	151500	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	337	513	562	9.1	46.683	0.5	0.2334	0	0	358.4	50000	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	343	261	562	11	28.71	0.5	0.1436	0	0	175.2	18500	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	344	237	413	15.5	36.735	0.5	0.1837	0	0	175.2	33500	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	
Matt Park P.S.	345	162	562	16.2	26.244	0.5	0.1312	0	0	175.2	12500	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0	

TABLE A-1

Baseline Runoff Basin Parameters

Stations and Trunks	Basin ID	Size (acres)	ADWF (gpad)	% Imperv.	Conn. Acres	% Conn. Imperv.	Conn. Imp. Ac	Perv. Perv.	Conn. Perv. Ac	Leakage (gpad)	Basin Width (ft.)	Mannings Perv.	Detention Imperv. (in.)	Detention Perv. (in.)	Soil Perm (in./hr.)	Rain Gauges:						
																Perv.	RG1	RG2	RG3	THEIS1	THEIS2	THEIS3
Matt. Park P.S.	361	512.9	413	11.8	60.522	0.5	0.3026	0	0	320	58000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Matt. Park P.S.	362	523	413	9.5	49.685	0.5	0.2484	0	0	320	73500	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Matt. Park P.S.	370	280	385	10	26	0.5	0.13	0	0	358.4	28400	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0
Matt. Park P.S.	371	289	657	9	26.01	0.5	0.1301	0	0	716.8	30800	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0
Matt. Park P.S.	386	200	632	20	40	0.5	0.2	0	0	448	31800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Subtotal		11,358			1,724	10	169	12	1,144													
Logboom R. S.	363	266	486	9.8	26.068	0.5	0.1303	0	0	268.8	23500	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Logboom R. S.	364	269	488	27.8	74.782	0.5	0.3739	0	0	448	33500	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Logboom R. S.	372	450	782	11.3	50.85	0.5	0.2543	0	0	192	42400	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0
Logboom R. S.	373	478	782	7	33.32	0.5	0.1666	0	0	128	19200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Logboom R. S.	374	213	782	9.9	21.087	0.5	0.1054	0	0	192	23500	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Subtotal		1,674			206	1	1	0	0													
Kenmore P.S.	327	540	389	25.8	139.32	0.5	0.8968	0	0	39.9	3100	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	328	370	399	26.5	96.05	0.5	0.4903	0	0	39.9	3400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	331	304	517	20.4	62.016	0.5	0.3101	0	0	51.7	36200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	332	353	517	20	70.6	0.5	0.363	0	0	51.7	48800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	333	376	517	27.2	102.27	0.5	0.5114	0	0	51.7	44400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	334	192	362	20.7	39.744	0.5	0.1987	0	0	36.2	28000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	335	74	517	6.5	4.81	0.5	0.0241	0	0	51.7	9800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	365	398.1	393	27.4	109.08	0.5	0.5454	0	0	39.3	53750	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	366	441	440	8.5	37.485	0.5	0.1874	0	0	44	36000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	367	249	440	10.2	25.398	0.5	0.127	0	0	44	19000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	368	333	440	9	29.97	0.5	0.1469	0	0	44	38000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	375	337	433	8	26.96	0.5	0.1348	0	0	43.3	23500	0.35	0.09	0.01	0.175	0.03	1	0	0	1	0	0
Kenmore P.S.	376	142	433	31.2	44.304	0.5	0.2215	0	0	43.3	15700	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	377	411	433	9.7	39.867	0.5	0.1993	0	0	43.3	39700	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	378	142	433	17.5	24.85	0.5	0.1243	0	0	43.3	13700	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	379	517	433	8.8	45.496	0.5	0.2275	0	0	43.3	48800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	380	419	433	11.6	48.604	0.5	0.243	0	0	43.3	38600	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	381	392	433	11.9	46.648	0.5	0.2332	0	0	43.3	38100	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	382	142	433	23.5	33.37	0.5	0.1669	0	0	43.3	34500	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	383	66	433	32	21.12	0.5	0.1056	0	0	43.3	4600	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	384	273	433	15.5	42.315	0.5	0.2116	0	0	43.3	19600	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	385	53	433	6.5	3.445	0.5	0.0172	0	0	43.3	4400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	397	115	517	8.1	9.315	0.5	0.0466	0	0	51.7	11200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	398	360	362	12.5	45	0.5	0.225	0	0	36.2	25200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Subtotal		6,999			1,150	1	6	0	0													
Woodin. P.S.	328	680	161	33.5	221.1	0.5	1.1055	0	0	448	3700	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Woodin. P.S.	330	310	161	9.5	29.45	0.5	0.1473	0	0	16.1	3400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Subtotal		970			251	1	1	0	0													
Hollywood P.S.	348	451	363	6.3	28.413	0.5	0.1421	0	0	36.3	22000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	347	1147	363	6.3	72.261	0.5	0.3613	0	0	36.3	64000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	348	241	726	7.5	18.075	0.5	0.0904	0	0	72.6	12200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	349	882	824	9.8	86.436	0.5	0.4322	0	0	82.4	64800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	350	253	824	9	22.77	0.5	0.1139	0	0	82.4	19200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	351	238	824	10	23.8	0.5	0.119	0	0	82.4	17600	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	352	685	824	38.3	254.7	0.5	1.2735	0	0	82.4	45600	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	353	530	726	36.5	193.45	0.5	0.9673	0	0	72.6	24000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0

		TABLE A-1																															
Stations and Trunks	Basin ID	Size (acres)	ADWV (gpad)	Baseline Runoff Basin Parameters										Soil Permeability (in./hr.)	Suction Head (in.)	Rain Gauges:			THEIS1	THEIS2	THEIS3												
				% Imperv.	Acres	% Conn.	Conn.	% Conn.	Conn.	Perv. Ac.	Perv.	Leakage (gpad)	Width (ft.)	Perv.	Imperv. (in.)	Perv. (in.)	Detention	Detention	RG1	RG2	RG3												
Hollywood P.S.	354	256	689	11.5	29.44	0.5	0.1472	0	0	68.9	27200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
Hollywood P.S.	355	488	689	9.7	47.336	0.5	0.2367	0	0	68.9	43200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
Hollywood P.S.	356	388	689	10.4	38.272	0.5	0.1914	0	0	68.9	33800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
Hollywood P.S.	357	329	824	37.8	124.36	0.5	0.6218	0	0	82.4	14400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
Hollywood P.S.	358	368	689	40.5	149.04	0.5	0.7452	0	0	68.9	12800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
Hollywood P.S.	359	209	689	7.5	15.675	0.5	0.0784	0	0	68.9	14400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
Hollywood P.S.	360	744	689	12.2	90.768	0.5	0.4538	0	0	68.9	75200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
Hollywood P.S.	399	302	733	11.6	35.032	0.5	0.1752	0	0	73.3	49920	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
Hollywood P.S.	400	748	733	10	74.8	0.5	0.374	0	0	73.3	128000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0											
	Subtotal			8,219		1,305	1	7	0	0																							
Interbay	151	145.3	680	16	23.248	30	6.9744	0	0	400	23200	0.335	0.067	0.25	20	5	12	0	0	1	0	0											
Interbay	152	389.3	500	23	89.539	25	22.385	0	0	400	46870	0.34	0.017	0.25	1	15	12	0	0	1	0	0											
Interbay	153	106.9	550	21	22.449	25	5.6123	0	0	400	21850	0.348	0.017	0.25	5	5	12	0	0	1	0	0											
Interbay	154	106.7	480	25	26.675	25	6.6688	0	0	400	15500	0.35	0.017	0.25	0.1	16	12	0	0	1	0	0											
Interbay	155	112.1	640	63	70.623	30	21.187	0	0	400	8260	0.338	0.067	0.25	10	8	12	0	0	1	0	0											
Interbay	156	56.1	1000	59	33.099	30	9.9267	0	0	400	8160	0.154	0.067	0.25	15	5	12	0	0	1	0	0											
Interbay	175	161	840	35	56.35	100	56.35	100	104.65	400	27300	0.275	0.067	0.25	0.02	20	11	12	0	0	0.94	0.06	0										
Interbay	178	91	1500	73	68.43	100	68.43	100	24.57	400	21600	0.35	0.067	0.25	0.02	20	11	0	0	1	0	0											
Interbay	179	88.7	17000	80	69.36	100	69.36	100	17.34	400	23500	0.1	0.067	0.25	0.02	20	11	20	0	0	0.95	0.05	0										
Interbay	181	15	9000	80	12	100	12	100	3	400	4600	0.1	0.017	0.25	0.02	20	20	0	0	1	0	0											
Interbay	182	7.1	600	93	6.603	100	6.603	100	0.497	400	1900	0.1	0.067	0.25	0.02	20	20	0	0	1	0	0											
Interbay	199	53	400	76	40.28	100	40.28	100	12.72	400	4700	0.19	0.067	0.25	20	5	15	0	0	1	0	0											
Interbay	202	47	1800	78	36.66	30	10.998	0	0	400	4000	0.1	0.067	0.25	25	4	15	0	0	1	0	0											
	Subtotal			1,377		553	61	335	20	163																							
Den. Loc. R.S.	178	211	1240	85	179.35	100	179.35	100	31.85	400	37000	0.35	0.067	0.25	0.02	20	11	0	0	1	0	0											
Denny LU R.S.	177	222	1650	85	188.7	100	188.7	100	33.3	400	38200	0.35	0.035	0.25	0.02	20	11	0	0	1	0	0											
Denny LU R.S.	190	95	900	28	28.6	100	26.6	100	68.4	400	19100	0.335	0.03	0.25	0.02	20	3	0	0	1	0	0											
Denny LU R.S.	191	47	600	21	9.87	48	4.7376	25	9.2825	400	10400	0.335	0.03	0.25	0.02	20	3	0	0	1	0	0											
Denny LU R.S.	192	37	1000	30	11.1	100	11.1	100	25.9	400	7200	0.32	0.03	0.25	0.02	20	3	0	0	1	0	0											
Denny LU R.S.	193	34	2200	27	9.18	100	9.18	100	24.82	400	6400	0.1	0.067	0.25	0.02	20	3	0	0	1	0	0											
Denny LU R.S.	194	83	4000	35	29.05	100	29.05	100	53.95	400	17700	0.32	0.067	0.25	0.02	20	3	0	0	1	0	0											
Denny LU R.S.	195	34	1000	13	4.42	100	4.42	100	29.58	400	5000	0.31	0.067	0.25	0.02	20	3	0	0	1	0	0											
Denny LU R.S.	196	125	640	20	25	100	25	100	100	400	23000	0.325	0.067	0.25	0.02	20	3	20	0	0	0.14	0.06	0										
Denny LU R.S.	197	98.7	1600	59	58.233	80	46.586	0	0	400	27800	0.325	0.067	0.25	0.02	20	3	11	20	0	0.04	0.53	0.43										
Denny LU R.S.	203	135	1100	75	101.25	100	101.25	100	33.75	400	22800	0.325	0.067	0.25	0.02	20	11	20	0	0.97	0.03	0											
Denny LU R.S.	204	88.6	1400	85	75.31	100	75.31	100	13.29	400	18400	0.35	0.067	0.25	0.02	20	11	20	0	0.52	0.47	0											
Denny LU R.S.	205	22	1200	81	17.82	100	17.82	100	4.18	400	3400	0.1	0.067	0.25	0.02	20	11	20	0	0.4	0.6	0											
Denny LU R.S.	206	316	3500	85	268.6	70	188.02	0	0	400	44600	0.345	0.01	0.25	0.02	20	20	0	0	1	0	0											
Denny LU R.S.	207	216	4400	85	183.6	70	128.52	0	0	400	33800	0.335	0.01	0.25	0.02	20	20	0	0	1	0	0											
	Subtotal			1,553		1,009	85	856	73	306																							
King St. R.S.	180	141	10	80	112.8	100	112.8	100	28.2	400	23900	0.338	0.067	0.25	0.02	20	11	20	0	0.17	0.82	0											
Conn. St. R.S.	183	219	750	22	48.18	100	48.18	100	170.82	400	28400	0.325	0.034	0.25	0.2	20	15	20	0	0.04	0.96	0											
Conn. St. R.S.	184	92	2200	34	31.28	100	31.28	100	60.72	400	11000	0.1	0.034	0.25	0.2	20	15	20	0	0.1	0.9	0											
Conn. St. R.S.	185	228.2	1700	40	91.28	86	78.501	80	109.54	400	31300	0.35	0.067	0.25	0.2	20	15	20	0	0.1	0.9	0											
Conn. St. R.S.	186	165.8	1400	39	64.662	100	64.662	100	101.14	400	22700	0.19	0.067	0.25	0.2	20	15	20	0	0.59	0.41	0											
	Subtotal			705		235	95	223	94	442																							

TABLE A-1

Baseline Runoff Basin Parameters

Stations and Trunks	Basin ID	Size (acres)	ADWIF (gpad)	% Imperv.	Imp. Acres	% Conn.	Conn.	% Conn.	Conn.	Leakage (gpad)	Width (ft.)	Mannings Perv.	Detention Perv.	Detention Imperv. (in.) (in.hr.)	Soil Perm	Suction Head (in.)	Rain Gauges:					
																	Perv.	RG1	RG2	RG3	THEIS1	THEIS2
Lander #1 R.S.	187	216	1600	25	54	100	54	100	162	400	26600	0.293	0.02	0.25	20	5	15	20	0	0.03	0.07	0
Lander #1 R.S.	188	93	1800	81	75.33	100	75.33	100	17.67	400	10300	0.1	0.067	0.25	20	5	15	0	0	1	0	0
Lander #1 R.S.	189	34	1200	65	28.9	100	28.9	100	5.1	400	1300	0.1	0.067	0.25	20	5	15	0	0	1	0	0
Lander #1 R.S.	200	72	800	83	66.96	100	66.96	100	5.04	400	4600	0.1	0.067	0.25	20	5	15	0	0	1	0	0
Lander #1 R.S.	201	65.8	1500	78	51.324	100	51.324	100	14.476	400	11400	0.11	0.067	0.25	20	5	15	0	0	1	0	0
Lander #1 R.S.	206	142	900	28	39.76	100	39.76	100	102.24	400	23000	0.3	0.067	0.25	0.02	20	20	0	0	1	0	0
Lander #1 R.S.	209	234	1030	24	56.16	100	56.16	100	177.84	400	41000	0.295	0.067	0.25	0.02	20	15	20	0	0.01	0.99	0
Lander #1 R.S.	222	147	840	25	36.75	100	36.75	100	110.25	400	27400	0.345	0.067	0.25	0.02	20	15	20	0	0.48	0.54	0
Lander #1 R.S.	223	128	900	28	35.84	100	35.84	100	92.16	400	20800	0.35	0.067	0.25	0.02	20	20	0	0	1	0	0
Lander #1 R.S.	224	238	1260	28	66.84	100	66.84	100	171.36	400	33000	0.268	0.067	0.25	0.02	20	20	0	0	1	0	0
Lander #1 R.S.	225	330	2620	38	125.4	100	125.4	100	204.6	400	46200	0.35	0.03	0.25	0.02	20	20	0	0	1	0	0
Lander #1 R.S.	226	100	2380	51	51	100	51	100	49	400	14900	0.225	0.03	0.25	0.02	20	20	0	0	1	0	0
Lander #1 R.S.	227	232	1860	32	74.24	100	74.24	100	157.76	400	36300	0.34	0.03	0.25	1	10	15	20	0	0.04	0.96	0
Lander #1 R.S.	231	156	890	23	35.88	35	12.556	10	12.012	400	23400	0.35	0.067	0.25	0.02	20	20	0	0	1	0	0
Subtotal		2,188			798	97	775	92	1,282													
Hamford#2 R.S.	217	338	880	24	81.12	67.5	70.98	85	218.35	400	36500	0.31	0.067	0.25	0.02	20	15	18	20	0.32	0.01	0.67
Hamford#2 R.S.	218	218	860	21	45.78	56	25.637	40	68.888	400	40700	0.345	0.067	0.25	0.02	20	18	20	0	0.79	0.21	0
Hamford#2 R.S.	219	144.2	480	15	21.63	100	21.63	100	122.57	400	13000	0.345	0.067	0.25	0.02	20	15	20	0	0.99	0.01	0
Hamford#2 R.S.	220	230	3000	27	82.1	45	27.945	10	16.79	400	32100	0.308	0.067	0.25	0.001	4	15	0	0	1	0	0
Hamford#2 R.S.	221	37	2800	60	22.2	100	22.2	100	14.8	400	3600	0.065	0.067	0.25	0.001	4	15	0	0	1	0	0
Hamford#2 R.S.	228	22	2800	70	15.4	100	15.4	100	6.6	400	10000	0.065	0.067	0.25	0.001	4	15	0	0	1	0	0
Hamford#2 R.S.	229	38	2800	70	26.6	100	26.6	100	11.4	400	3500	0.065	0.067	0.25	0.001	4	15	0	0	1	0	0
Hamford#2 R.S.	230	148	2800	65	95.2	84	80.808	80	41.44	400	15000	0.065	0.067	0.25	0.001	4	15	0	0	1	0	0
Subtotal		1,175			371	78	291	62	501													
Rainier P.S.	210	279	630	16	44.64	35	15.624	10	23.436	400	41200	0.34	0.067	0.25	0.02	20	18	0	0	1	0	0
Rainier P.S.	211	123	1260	32	39.36	35	13.776	10	8.384	400	27000	0.245	0.067	0.25	0.02	20	18	0	0	1	0	0
Rainier P.S.	212	66	760	10.3	6.798	35	2.3793	10	5.9202	400	13700	0.34	0.067	0.25	0.02	20	18	0	0	1	0	0
Rainier P.S.	213	237	860	14	33.18	35	11.613	10	20.382	400	41200	0.345	0.067	0.25	0.02	20	18	0	0	1	0	0
Rainier P.S.	214	313	1040	25	78.25	35	27.388	10	23.475	400	52600	0.335	0.03	0.25	0.02	20	18	0	0	1	0	0
Rainier P.S.	215	252	600	22	55.44	49	27.186	30	58.968	400	28200	0.335	0.03	0.25	0.001	20	15	16	18	0.23	0.05	0.72
Rainier P.S.	216	101	860	20	20.2	70	14.14	60	46.48	400	18900	0.1	0.03	0.25	0.001	20	18	0	0	1	0	0
Subtotal		1,371			278	40	112	17	189													
E. Duwamish	241	51.8	3600	60	30.96	100	30.96	100	20.64	400	7000	0.03	0.067	0.25	10	7	15	0	0	1	0	0
E. Duwamish	242	235	500	45	105.75	20	21.15	0	0	400	15700	0.065	0.067	0.25	10	7	15	0	0	1	0	0
E. Duwamish	243	165	500	40	66	20	13.2	0	0	400	6700	0.03	0.067	0.25	10	7	15	0	0	1	0	0
E. Duwamish	244	400	200	25	100	20	20	0	0	400	31800	0.138	0.067	0.25	1	3	15	0	0	1	0	0
Subtotal		852			303	28	85	4	21													
Brandon R.S.	281	87.1	3200	56	37.576	100	37.576	100	29.524	400	10600	0.19	0.067	0.25	10	7	15	0	0	1	0	0
Brandon R.S.	282	63.8	3400	61	38.918	100	38.918	100	24.882	400	10400	0.094	0.067	0.25	10	7	15	16	0	0.78	0.22	0
Brandon R.S.	283	63.8	2400	61	38.918	93	36.194	90	22.394	400	5800	0.03	0.067	0.25	10	7	15	16	0	0.22	0.78	0
Subtotal		195			115	98	113	97	77													
Michigan R.S.	236	128	400	42.6	34.528	10	5.4528	0	0	400	20400	0.308	0.067	0.25	0.5	2	16	18	0	0.63	0.37	0
Michigan R.S.	237	70.7	600	75	53.025	0	0	0	0	400	6800	0.092	0.067	0.25	10	7	16	0	0	1	0	0
Michigan R.S.	238	278.6	710	29	80.794	100	80.794	100	197.81	400	42800	0.31	0.067	0.25	0.02	20	15	16	18	0.02	0.98	0
Michigan R.S.	239	26.4	2200	60	15.84	100	15.84	100	10.56	400	4800	0.065	0.067	0.25	10	7	16	0	0	1	0	0
Michigan R.S.	240	49.8	2600	64	31.872	100	31.872	100	17.928	400	7000	0.19	0.067	0.25	1	15	16	0	0	1	0	0
Michigan R.S.	259	172.1	570	24	41.304	100	41.304	100	130.8	400	28200	0.325	0.04	0.25	0.02	20	15	16	0	0.73	0.27	0

TABLE A-1

Baseline Runoff Basin Parameters

TABLE A-1																						
Baseline Runoff Basin Parameters																						
Stations and Trunks	Basin ID	Size (acres)	ADWF (gpad)	% Conn.					Conn. Perv.	Conn. Perv. Ac.	Leakage (gpad)	Basin Width (ft.)	Mannings	Detention Perv. (in.)	Detention Perv. (in./hr.)	Soil Perm (in./hr.)			Rain Gauges:			
				Imperv.	Acres	Imperv.	Imperv.	Imperv. Ac.								(in.)	RG1	RG2	RG3	THEIS1	THEIS2	THEIS3
Michigan R.S.	260	22.5	1100	46	10.35	100	10.35	100	12.15	400	5200	0.254	0.067	0.25	10	7	16	0	0	1	0	0
Michigan R.S.	269	73.1	3400	74	54.094	0	0	0	0	400	7200	0.03	0.067	0.25	10	7	15	16	0	0.2	0.8	0
Michigan R.S.	270	44.6	1060	39	17.394	100	17.394	100	27.206	400	8400	0.275	0.067	0.25	10	7	16	0	0	1	0	0
Michigan R.S.	271	57.1	2300	51	29.121	100	29.121	100	27.979	400	9100	0.208	0.067	0.25	10	7	15	16	0	0.42	0.58	0
Michigan R.S.	272	45.8	3200	71	32.518	100	32.518	100	13.282	400	3200	0.065	0.04	0.25	10	7	15	16	0	0.35	0.65	0
Michigan R.S.	273	40.5	3800	70	28.35	100	28.35	100	12.15	400	6800	0.03	0.087	0.25	10	7	16	0	0	1	0	0
Michigan R.S.	413	73.1	0	74	54.094	100	54.094	100	19.006	0	7200	0.03	0.067	0.25	10	7	15	16	0	0.2	0.8	0
Subtotal		1,009			449	77	347	84	469													
E. Marg. P.S.	246	159.7	2300	78.8	125.64	79	99.416	70	23.699	400	14500	0.065	0.067	0.25	10	7	16	0	0	1	0	0
E. Marg. P.S.	247	371	2200	77.8	288.64	37	106.8	10	8.2362	400	18600	0.065	0.067	0.25	10	7	16	0	0	1	0	0
E. Marg. P.S.	261	106.2	3200	63	68.908	86	57.539	80	31.435	400	14400	0.03	0.067	0.25	10	7	16	0	0	1	0	0
Subtotal		637			481	55	264	41	63													
Norfolk R.S.	234	55.9	680	23	12.857	30	3.8571	0	0	400	8600	0.293	0.067	0.25	0.06	18	10	18	0	0.91	0.09	0
Norfolk R.S.	235	140	500	25	35	56.2	19.67	56.2	59.01	500	19300	0.35	0.01	0.01	0.03	2	18	0	0	1	0	0
Norfolk R.S.	235	229	500	25	57.25	56.2	32.175	56.2	96.524	500	33100	0.35	0.01	0.01	0.03	2	16	18	0	0	1	0
Norfolk R.S.	254	262	500	25	65.5	56.2	36.811	56.2	110.43	500	41600	0.35	0.01	0.01	0.03	2	16	18	0	0.18	0.82	0
Norfolk R.S.	255	155	500	25	38.75	56.2	21.776	56.2	65.333	500	22000	0.35	0.01	0.01	0.03	2	16	18	0	0.02	0.98	0
Norfolk R.S.	256	145	500	25	36.25	56.2	20.373	56.2	61.118	500	20400	0.35	0.01	0.01	0.03	2	18	0	0	1	0	0
Norfolk R.S.	257	340	1000	20	68	30	20.4	0	0	400	55800	0.345	0.067	0.25	0.02	20	18	0	0	1	0	0
Norfolk R.S.	258	24.4	907.2	28.1	6.8564	30	2.0569	0	0	400	3200	0.35	0.067	0.25	0.02	20	18	0	0	1	0	0
Norfolk R.S.	262	156.1	740	28.8	44.957	100	44.957	100	111.14	400	13800	0.308	0.067	0.25	0.5	10	10	16	18	0.96	0	0.01
Norfolk R.S.	265	124.2	491.4	15	18.63	30	5.589	0	0	400	18700	0.345	0.067	0.25	0.03	10	10	0	0	1	0	0
Norfolk R.S.	266	237	447.3	16	37.92	51	19.339	30	59.724	400	29700	0.335	0.067	0.25	0.04	10	10	18	0	1	0	0
Norfolk R.S.	267	262.8	453.6	11	28.908	100	28.908	100	233.89	400	34650	0.345	0.067	0.25	10	2	10	0	0	1	0	0
Norfolk R.S.	268	241	1520	28	67.48	93	62.756	90	158.17	400	13200	0.261	0.067	0.25	0.5	5	10	0	0	1	0	0
Norfolk R.S.	274	33	320	7	2.31	100	2.31	100	30.69	400	4000	0.32	0.067	0.25	10	2	10	0	0	1	0	0
Norfolk R.S.	275	141.8	560	9	12.762	100	12.762	100	129.04	400	23525	0.335	0.067	0.25	10	7	10	0	0	1	0	0
Norfolk R.S.	276	62	528.2	20	12.4	30	3.72	0	0	400	9600	0.335	0.067	0.25	0.02	20	18	0	0	1	0	0
Norfolk R.S.	277	60	522.9	21	12.6	30	3.78	0	0	400	8500	0.345	0.067	0.25	0.02	20	18	0	0	1	0	0
Norfolk R.S.	278	90	600	23	20.7	30	6.21	0	0	400	14200	0.34	0.067	0.25	0.02	20	18	0	0	1	0	0
Norfolk R.S.	279	144	720	20	28.8	30	8.64	0	0	400	21600	0.345	0.067	0.25	0.02	20	10	18	0	0.22	0.78	0
Norfolk R.S.	280	88	500	25	22	56.2	12.364	56.2	37.092	500	12700	0.35	0.01	0.01	0.03	2	10	16	18	0.01	0.2	0.79
Norfolk R.S.	393	275	860	20.5	56.375	0	0	0	0	400	38500	0.33	0.067	0.25	0.02	20	10	0	0	1	0	0
Norfolk R.S.	394	184	560	14	25.78	0	0	0	0	400	32750	0.33	0.067	0.25	0.02	20	10	0	0	1	0	0
Norfolk R.S.	395	109.7	640	13.4	14.7	0	0	0	0	400	28000	0.345	0.067	0.25	0.02	20	10	0	0	1	0	0
Norfolk R.S.	437	224.2	700	57	127.79	0	0	0	0	400	11500	0.075	0.03	0.25	12	7	10	0	0	1	0	0
Subtotal		3,784			855	43	368	39	1,150													
Henderson P.S.	232	272.5	453.6	10	27.25	30	8.175	0	0	400	48600	0.31	0.067	0.25	0.02	20	18	0	0	1	0	0
Henderson P.S.	233	178	510.3	20	35.6	30	10.68	0	0	400	19400	0.345	0.067	0.25	0.05	17	10	18	0	0.35	0.65	0
Henderson P.S.	263	119	504	21	24.99	30	7.497	0	0	400	24500	0.345	0.067	0.25	0.02	20	10	0	0	1	0	0
Henderson P.S.	264	253	302.4	12	30.36	44	13.358	20	44.528	400	32200	0.32	0.067	0.25	0.02	20	10	0	0	1	0	0
Henderson P.S.	406	186.6	491.4	15	29.49	30	8.847	0	0	400	29500	0.345	0.067	0.25	0.03	19	10	0	0	1	0	0
Subtotal		1,019			148	33	49	5	45													
W. Duwamish	264	232	3200	61	141.52	30	42.456	0	0	400	16200	0.03	0.067	0.25	0.001	7	14	15	0	0.28	0.72	0
W. Duwamish	285	158	3600	68	107.44	30	32.232	0	0	400	13600	0.03	0.067	0.25	0.001	7	14	15	0	0.04	0.98	0
W. Duwamish	287	56	2000	69	36.64	30	11.592	0	0	400	2800	0.03	0.067	0.25	0.02	20	15	0	0	1	0	0
W. Duwamish	289	59	1700	37	21.83	79	17.246	70	26.019	400	9200	0.31	0.067	0.25	0.02	20	15	0	0	1	0	0
W. Duwamish	290	164	560	14	22.96	51	11.71	30	42.312	400	21600	0.31	0.067	0.25	0.02	20	15	0	0	1	0	0

Stations and Trunks	Basin ID	Size (acres)	TABLE A-1												Soil Perm	Suction	Rain Gauges:											
			Baseline Runoff Basin Parameters															(in.)	(in./hr.)	Head (in.)	RG1	RG2	RG3	THEIS1	THEIS2	THEIS3		
			ADV/F (gpm)	% Imp.	% Conn. Imperv.	Conn. Imp. Ac.	% Conn. Perv.	Conn. Perv. Ac.	Leakage (gpm)	Width (ft.)	Basin Perv.	Mannings	Detention Imperv. (in.)	Detention Perv. (in.)														
W. Duwamish	291	252	1400	43	108.36	44	47.678	20	28.728	400	4800	0.315	0.067	0.25	1	1	15	0	0	1	0	0	0					
W. Duwamish	292	104	240	8	8.32	44	3.6608	20	18.136	400	2400	0.31	0.067	0.25	1	1	15	18	17	0.26	0.48	0.26	0					
W. Duwamish	298	25	2800	54	13.5	30	4.05	0	0	400	3400	0.1	0.067	0.25	0.02	20	15	0	0	1	0	0	0					
Subtotal		1,050			463	37	171	20	116																			
Chelan R.S.	286	319	2040	55	175.45	30	52.635	0	0	400	16800	0.2	0.067	0.25	0.02	20	14	15	0	0.98	0.02	0	0					
Chelan R.S.	288	85	2040	44	37.4	59	21.692	40	19.04	400	13600	0.215	0.067	0.25	0.02	20	14	15	0	0.22	0.78	0	0					
Chelan R.S.	310	71	450	17	12.07	100	12.07	100	58.93	400	10700	0.315	0.067	0.25	5	5	14	15	0	0.07	0.93	0	0					
Chelan R.S.	311	220	800	23	50.8	100	50.8	100	169.4	400	27500	0.33	0.067	0.25	0.02	20	14	15	0	0.32	0.68	0	0					
Chelan R.S.	312	209	440	17	35.53	100	35.53	100	173.47	400	15500	0.31	0.067	0.25	3	5	5	15	17	0.15	0.76	0.08	0					
Chelan R.S.	313	159	600	29	46.11	30	13.833	0	0	400	21300	0.31	0.067	0.25	4	6	5	15	0	0.51	0.49	0	0					
Chelan R.S.	314	30	600	21	6.3	100	6.3	100	23.7	400	4800	0.335	0.067	0.25	0.02	20	5	0	0	1	0	0	0					
Chelan R.S.	315	389	450	21	81.69	30	24.507	0	0	400	49200	0.335	0.067	0.25	1	9	5	17	0	0.32	0.68	0	0					
Chelan R.S.	316	94.5	325	23	21.735	65	14.128	50	36.383	400	17300	0.335	0.067	0.25	5	5	17	0	0	1	0	0	0					
Chelan R.S.	317	188	450	16	30.08	30	9.024	0	0	400	31300	0.305	0.067	0.25	0.06	18	15	16	17	0.27	0.01	0.72	0					
Chelan R.S.	318	121	450	20	24.2	100	24.2	100	96.8	400	18100	0.31	0.067	0.25	0.06	16	17	0	0	1	0	0	0					
Chelan R.S.	319	193	650	20	38.6	90	34.74	85.7	132.32	400	27900	0.35	0.02	0.25	0.02	20	17	0	0	1	0	0	0					
Chelan R.S.	320	47	520	20	9.4	100	9.4	100	37.6	400	8000	0.325	0.067	0.25	5	3	15	17	0	0.3	0.7	0	0					
Subtotal		2,126			569	54	309	48	748																			
Harbor R.S.	308	144.3	740	19	27.417	100	27.417	100	116.88	400	22700	0.305	0.067	0.25	20	6	14	0	0	1	0	0	0					
Harbor R.S.	309	312.6	1200	32	100.03	100	100.03	100	212.57	400	49700	0.1	0.067	0.25	5	5	14	0	0	1	0	0	0					
Subtotal		457			127	100	127	100	329																			
W. Mich. R.S.	293	170	840	19	32.3	30	9.69	0	0	400	31000	0.35	0.067	0.25	25	4	17	0	0	1	0	0	0					
W. Marg. P.S.	294	9	2400	32	2.88	100	2.88	100	6.12	400	1000	0.11	0.067	0.25	0.02	20	16	0	0	1	0	0	0					
W. Marg. P.S.	297	50	3040	58	29	65	18.85	50	10.5	400	4500	0.21	0.067	0.25	1	8	16	17	0	0.19	0.81	0	0					
W. Marg. P.S.	299	17	600	16	2.72	0	0	0	0	400	3400	0.325	0.067	0.25	40	2	16	17	0	0.2	0.8	0	0					
W. Marg. P.S.	300	60	700	10	6	0	0	0	0	400	12400	0.265	0.067	0.25	40	2	17	0	0	1	0	0	0					
W. Marg. P.S.	301	50	3600	62	31	100	19	400	9200	0.126	0.067	0.25	0.02	20	16	17	0	0.93	0.07	0	0	0	0					
W. Marg. P.S.	302	40	3600	62	24.8	86	21.328	80	12.16	400	8600	0.03	0.067	0.25	0.02	20	16	0	0	1	0	0	0					
W. Marg. P.S.	303	19	3360	52	9.88	51	5.0388	30	2.736	400	2800	0.03	0.067	0.25	0.02	20	16	0	0	1	0	0	0					
W. Marg. P.S.	304	21	3000	45	9.45	65	6.1425	50	5.775	400	2400	0.03	0.067	0.25	0.02	20	16	0	0	1	0	0	0					
W. Marg. P.S.	306	58	530	9	5.22	0	0	0	0	400	9700	0.305	0.067	0.25	40	2	17	0	0	1	0	0	0					
W. Marg. P.S.	307	147.5	1000	37	54.575	10	5.4575	0	0	400	13300	0.285	0.067	0.25	1	7	16	17	0	0.67	0.33	0	0					
W. Marg. P.S.	309	495	1330	20.2	99.99	0	0	0	0	400	42200	0.24	0.067	0.25	0.02	20	17	0	0	1	0	0	0					
W. Marg. P.S.	391	329	860	16.1	52.969	0	0	0	0	400	47200	0.32	0.067	0.25	0.02	20	17	0	0	1	0	0	0					
W. Marg. P.S.	392	500	660	11.9	59.5	0	0	0	0	400	65600	0.32	0.067	0.25	0.02	20	17	0	0	1	0	0	0					
W. Marg. P.S.	401	116.5	1387	25	29.125	0	0	0	0	400	23600	0.035	0.067	0.25	0.02	20	17	0	0	1	0	0	0					
Subtotal		1,912			417	22	91	4	56																			
8th Ave. S. R.S.	295	143	1660	29	41.47	40	16.588	35	35.536	400	15400	0.275	0.067	0.25	0.5	14	16	0	0	1	0	0	0					
8th Ave. S. R.S.	296	20	3360	54	10.8	50	5.4	50	4.6	400	2200	0.1	0.067	0.25	0.02	20	16	0	0	1	0	0	0					
8th Ave. S. R.S.	305	205	920	22	45.1	50	22.55	50	79.95	400	50000	0.335	0.06	0.25	0.005	7	16	17	0	0.55	0.45	0	0					
Subtotal		368			97	46	45	44	120																			

TABLE A-2
1996 Runoff Basin Parameters

TABLE A-2 1996 Runoff Basin Parameters																						
Stations and Trunks	Basin ID	Size (acres)	ADWF (gpad)	% Imperv.	Imp. Acres	% Conn. Imperv.	Conn. Imperv.	% Conn. Perv.	Conn. Perv.	Leakage (gpad)	Basin Width (ft.)	Mannings Perv.	Detention Imperm. (in.)	Detention Perv. (in.)	Soil Perm (in./hr.)	Suction Head (in.)	Rain Gauges:					
																	RG1	RG2	RG3	THEIS1	THEIS2	THEIS3
N. Interceptor	124	98.1	1700	40	38.44	30	11,532	0	0	400	9600	0.295	0.067	0.25	0.02	20	3	0	0	1	0	0
N. Interceptor	125	34.2	1650	49	16,758	30	5,0274	0	0	400	6120	0.325	0.067	0.25	0.02	20	3	0	0	1	0	0
N. Interceptor	128	70.9	1350	40	28.36	30	8,508	0	0	400	12080	0.325	0.067	0.25	0.02	20	3	0	0	1	0	0
N. Interceptor	127	28.2	700	22	5,784	30	1,7292	0	0	400	5400	0.31	0.067	0.25	0.02	20	3	0	0	1	0	0
N. Interceptor	128	172.5	780	25	43,125	100	43,125	100	120.38	400	31660	0.282	0.067	0.25	0.02	20	3	0	0	0.92	0.08	0
N. Interceptor	129	44.7	860	21	9,387	100	9,387	100	35,313	400	8550	0.35	0.067	0.25	0.02	20	3	0	0	0.85	0.15	0
N. Interceptor	130	52.7	840	20	12,54	100	12,54	100	50,16	400	7480	0.295	0.067	0.25	0.02	20	3	0	0	0.85	0.15	0
N. Interceptor	131	68.7	2000	23	15,801	100	15,801	100	52,899	400	11780	0.323	0.067	0.25	0.02	20	3	0	0	0.7	0.3	0
N. Interceptor	132	170	790	23	38.1	100	39.1	100	130.9	400	22460	0.325	0.067	0.25	0.02	20	3	0	0	0.75	0.25	0
N. Interceptor	133	200	1260	35	70	65	45.5	50	65	400	30550	0.3	0.067	0.25	0.02	20	3	0	0	0.12	0.88	0
N. Interceptor	134	148.4	1030	38	56,392	30	16,918	0	0	400	24550	0.293	0.067	0.25	0.02	20	3	0	0	0	0	0
N. Interceptor	135	349	1000	33	115.17	30	34,551	0	0	400	60550	0.32	0.067	0.25	0.02	20	9	0	0	1	0	0
N. Interceptor	136	39.2	1600	53	20,776	100	20,776	100	18,424	400	5830	0.063	0.067	0.25	0.02	20	9	0	0	1	0	0
N. Interceptor	137	24.2	1850	38	9,198	30	2,7588	0	0	400	4400	0.204	0.067	0.25	0.02	20	9	0	0	1	0	0
N. Interceptor	138	72.7	860	26	18,902	100	18,902	100	53,798	400	18000	0.31	0.067	0.25	0.02	10	3	0	0	0.25	0.75	0
N. Interceptor	139	51.4	1120	28	14,392	100	14,392	100	37,008	400	8000	0.31	0.067	0.25	0.02	1	6	0	0	0.25	0.75	0
N. Interceptor	140	310.6	1000	27	83,862	58	48,64	40	90,695	400	47600	0.309	0.067	0.25	0.02	5	5	11	12	0	0.06	0.93
N. Interceptor	141	124.2	740	16	19,872	37	7,3526	10	10,433	400	17250	0.348	0.067	0.25	0.1	10	11	12	0	0.29	0.71	0
N. Interceptor	142	203.3	950	28	56,924	100	56,924	100	146.38	400	7020	0.335	0.02	0.25	1	6	12	0	0	1	0	
N. Interceptor	143	132.9	830	21	27,909	86	24,002	80	83,993	400	26600	0.325	0.02	0.25	5	5	12	0	0	1	0	
N. Interceptor	144	42.4	1640	53	22,472	100	22,472	100	19,928	400	5490	0.211	0.067	0.25	40	2	8	12	0	0.88	0.12	
N. Interceptor	145	278.6	700	15	41.79	80	33,432	80	189,45	400	33800	0.343	0.02	0.25	10	3	8	12	0	0.59	0.41	
N. Interceptor	146	40.7	1360	33	13,431	100	13,431	100	27,269	400	3600	0.217	0.067	0.25	0.02	20	8	0	0	1	0	0
N. Interceptor	147	267.3	670	18	48,114	100	48,114	100	219,19	400	40150	0.335	0.067	0.25	15	5	8	12	0	0.28	0.72	
N. Interceptor	148	175.3	760	18	31,554	65	20,51	50	71,873	400	33200	0.34	0.067	0.25	0.02	20	7	8	0	0	0.03	0.97
N. Interceptor	324	45.7	600	63.2	28,882	37	10,688	10	1,6818	400	5826	0.345	0.067	0.25	0.02	20	3	0	0	1	0	0
N. Interceptor	325	47.9	1600	37.7	18,056	37	8,6816	10	2,9842	400	9729	0.34	0.067	0.25	0.02	20	3	0	0	1	0	0
N. Interceptor	326	79	1500	62.2	49,138	30	14,741	0	0	400	19700	0.32	0.067	0.25	0.02	20	3	0	0	1	0	0
N. Interceptor	387	182.1	520	10.6	19,303	30	5,7908	0	0	400	24800	0.295	0.067	0.25	0.02	20	2	0	0	1	0	0
N. Interceptor	388	253.3	460	20.9	52.94	30	15,882	0	0	400	28600	0.32	0.067	0.25	0.02	20	2	0	0	1	0	0
N. Interceptor	389	55.6	480	13.5	7,506	30	2,2518	0	0	400	8900	0.305	0.067	0.25	0.02	20	2	0	0	1	0	0
		Subtotal			3,870		1,036	61	631	51	1,437											
Baillard R.S.	1	223.9	760	25	55,975	100	55,975	100	167,93	400	39820	0.35	0.067	0.25	0.02	20	7	8	0	0.33	0.87	0
Baillard R.S.	2	236.8	820	25	59,225	100	59,225	100	177,68	400	44801	0.35	0.03	0.25	0.02	20	7	8	0	0.49	0.51	0
Baillard R.S.	3	222.4	780	21	46,704	100	46,704	100	175.7	400	47840	0.35	0.067	0.25	0.02	20	7	8	0	0.66	0.32	0
Baillard R.S.	4	336.7	650	21	70,707	100	70,707	100	265,99	400	48050	0.35	0.03	0.25	0.02	20	7	8	9	0	0.65	0.07
Baillard R.S.	5	341.4	630	22	75,108	100	75,108	100	266,29	400	58750	0.35	0.03	0.25	0.02	20	7	8	9	0	0.36	0.64
Baillard R.S.	6	138.7	630	24	33,288	30	9,9864	0	0	400	24100	0.35	0.03	0.25	0.02	20	9	0	0	1	0	0
Baillard R.S.	7	46.8	600	21	9,828	30	2,9484	0	0	400	7750	0.35	0.03	0.25	0.02	20	9	0	0	1	0	0
Baillard R.S.	8	47.7	620	24	11,448	30	3,4344	0	0	400	10300	0.35	0.03	0.25	0.02	20	9	0	0	1	0	0
Baillard R.S.	9	251.3	1010	35	87,955	30	26,387	0	0	400	50280	0.33	0.03	0.25	0.02	20	8	9	0	0.17	0.83	0
Baillard R.S.	10	97.7	1050	41	40,057	30	12,017	0	0	400	6200	0.2	0.067	0.25	0.02	20	8	0	0	1	0	0
Baillard R.S.	11	32.8	2000	44	14,432	30	4,3296	0	0	400	6200	0.03	0.067	0.25	0.02	20	8	0	0	1	0	0
Baillard R.S.	12	263.5	910	27	71,145	30	21,344	0	0	400	40860	0.35	0.067	0.25	0.02	20	8	0	0	1	0	0
Baillard R.S.	13	115	1600	49	56,35	30	16,905	0	0	400	20280	0.03	0.067	0.25	0.02	20	8	9	0	0.74	0.26	0
Baillard R.S.	14	50.7	940	23	11,661	30	3,4983	0	0	400	8760	0.35	0.067	0.25	0.02	20	9	0	0	1	0	0
Baillard R.S.	15	78.3	900	27	21,141	30	6,3423	0	0	400	13950	0.35	0.067	0.25	0.02	20	8	0	0	1	0	0
		Subtotal			2,484		665	62	415	58	1,054											
Carkeek P.S.	438	469.1	810	23	107,89	51	55,025	30	108,36	1280	86350	0.35	0.03	0.25	0.02	20	7	0	0	1	0	0
Carkeek P.S.	442	160.6	625	19	30,514	90	27,463	93	120,98	80	27600	0.35	0.03	0.25	1.27	19.2	7	0	0	1	0	

		TABLE A-2																								
		1998 Runoff Basin Parameters																Rain Gauges:								
Stations and Trunks	Basin ID	Size (acres)	ADWf (gpm)	% Imperv.	Acres	% Conn.	Conn. Perv.	% Conn.	Perv. Ac.	Leakage (gpm)	Width (ft.)	Basin Perv.	Mannings	Detention (in.)	Detention Perv. (in.)	Soil Perm (in./hr.)	Suction Head (in.)	RG1			RG2			RG3		
Carkeek P.S.	443	735.1	525	22	161.72	100	161.72	100	573.36	60	120000	0.35	0.03	0.25	2.52	18.3	7	0	0	1	0	0	THEIS1	THEIS2	THEIS3	
Carkeek P.S.	444	638.8	500	15	95.82	90	86.238	93	504.97	60	72000	0.35	0.03	0.25	4.76	16.7	7	0	0	1	0	0	0	0	0	
Subtotal		2,004			398	83	330	81	1,308																	
N. Beach P.S.	439	303	485.1	25	75.75	5	3.7875	0	0	109.4	51305	0.35	0.01	0.01	0.175	0.03	7	0	0	1	0	0	0	0	0	
N. Beach P.S.	440	248	471.8	25	62	8.7	5.394	0	0	579.3	43365	0.35	0.01	0.01	0.175	0.03	7	0	0	1	0	0	0	0	0	
N. Beach P.S.	441	102	303.9	25	25.5	15.4	3.927	0	0	15.8	13870	0.35	0.01	0.01	0.175	0.03	7	0	0	1	0	0	0	0	0	
Subtotal		653			163	8	13	0	0																	
Central Trunk	157	30.3	400	13	3.039	100	3.939	100	26.361	400	5900	0.325	0.067	0.25	5	5	3	11	0	0.07	0.93	0	0	0	0	
Central Trunk	158	58	400	24	13.92	100	13.92	100	44.08	400	7300	0.28	0.067	0.25	12	4	3	11	0	0.09	0.91	0	0	0	0	
Central Trunk	159	47	900	53	24.91	100	24.91	100	22.09	400	9400	0.298	0.067	0.25	0.02	20	3	8	11	0.22	0.11	0.67	0	0	0	
Central Trunk	166	97.2	790	23	22.356	100	22.356	100	74.844	400	13400	0.34	0.067	0.25	5	5	9	11	0	0.45	0.55	0	0	0	0	
Central Trunk	167	169.8	980	28	44.148	100	44.148	100	125.65	400	23500	0.348	0.067	0.25	2	10	8	11	12	0.34	0.55	0.11	0	0	0	
Central Trunk	168	173	850	24	41.52	100	41.52	100	131.46	400	23800	0.348	0.067	0.25	3	8	9	11	12	0.14	0.2	0.65	0	0	0	
Central Trunk	169	14	900	34	4.76	100	4.76	100	9.24	400	1850	0.275	0.067	0.25	30	3	9	0	0	1	0	0	0	0	0	
Central Trunk	174	86	930	26	22.36	100	22.36	100	63.64	400	14600	0.348	0.067	0.25	1	10	3	9	11	0.21	0.17	0.62	0	0	0	
Subtotal		675			178	100	178	100	497																	
Dexter R.S.	160	80	1160	40	32	100	32	100	48	400	11800	0.32	0.067	0.25	15	5	11	0	0	1	0	0	0	0	0	
Dexter R.S.	161	101	1290	43	43.43	100	43.43	100	57.57	400	13800	0.325	0.067	0.25	7	5	11	0	0	1	0	0	0	0	0	
Dexter R.S.	162	208.8	1260	41	85.608	100	85.608	100	123.19	400	27000	0.31	0.067	0.25	3	10	11	0	0	1	0	0	0	0	0	
Dexter R.S.	163	6.3	800	62	3.906	100	3.906	100	2.394	400	850	0.335	0.067	0.25	0.02	20	11	0	0	1	0	0	0	0	0	
Dexter R.S.	164	11	1400	83	9.13	100	8.13	100	1.87	400	2200	0.35	0.067	0.25	0.02	20	11	0	0	1	0	0	0	0	0	
Dexter R.S.	165	30	1000	88	26.4	100	26.4	100	3.6	400	5000	0.1	0.067	0.25	0.02	20	11	0	0	1	0	0	0	0	0	
Dexter R.S.	170	34	1900	78	26.52	93	24.664	90	6.732	400	6800	0.1	0.067	0.25	12	7	11	0	0	1	0	0	0	0	0	
Dexter R.S.	171	34	1600	83	26.22	100	26.22	100	5.78	400	6300	0.1	0.067	0.25	2	8	11	20	0	0.46	0.54	0	0	0	0	
Dexter R.S.	172	77	1400	67	51.59	100	51.59	100	25.41	400	13000	0.35	0.067	0.25	0.02	20	20	0	0	1	0	0	0	0	0	
Dexter R.S.	173	39	800	90	35.1	100	35.1	100	3.9	400	8600	0.1	0.067	0.25	0.02	20	11	20	0	0.22	0.78	0	0	0	0	
Subtotal		621			342	99	340	100	278																	
Montlake R.S.	98	130	820	22	28.6	30	8.58	0	0	400	24800	0.34	0.067	0.25	25	4	20	0	0	1	0	0	0	0	0	
Montlake R.S.	100	77	770	20	15.4	30	4.62	0	0	400	14500	0.34	0.067	0.25	15	8	20	0	0	1	0	0	0	0	0	
Montlake R.S.	101	27	800	11	2.97	30	0.891	0	0	400	5600	0.335	0.067	0.25	0.02	20	20	0	0	1	0	0	0	0	0	
Montlake R.S.	103	159	820	25	39.75	30	11.925	0	0	400	28400	0.35	0.067	0.25	10	6	20	0	0	1	0	0	0	0	0	
Montlake R.S.	104	241	850	24	57.84	79	45.694	70	128.21	400	39500	0.35	0.067	0.25	5	5	20	0	0	1	0	0	0	0	0	
Montlake R.S.	105	78	800	10	7.8	30	2.34	0	0	400	9400	0.335	0.067	0.25	0.02	20	3	20	0	0.22	0.78	0	0	0	0	
Montlake R.S.	106	147	560	9	13.23	30	3.969	0	0	400	21400	0.335	0.067	0.25	0.02	20	3	20	0	0.69	0.31	0	0	0	0	
Montlake R.S.	109	138	710	17	23.46	100	23.46	100	114.54	400	21100	0.335	0.067	0.25	0.5	5	20	0	0	1	0	0	0	0	0	
Montlake R.S.	110	28	600	17	4.76	100	4.76	100	23.24	400	3000	0.32	0.067	0.25	0.04	5	20	0	0	1	0	0	0	0	0	
Montlake R.S.	111	69.4	700	18	12.492	100	12.492	100	56.908	400	10300	0.335	0.067	0.25	0.02	5	3	0	0	1	0	0	0	0	0	
Montlake R.S.	112	209	640	18	37.62	100	37.62	100	171.38	400	34800	0.34	0.067	0.25	0.1	5	3	20	0	0.29	0.71	0	0	0	0	
Montlake R.S.	113	248	400	13	31.98	100	31.98	100	214.02	400	33000	0.33	0.067	0.25	1	5	3	0	0	1	0	0	0	0	0	
Montlake R.S.	114	85	730	20	17	30	5.1	0	0	400	14400	0.335	0.067	0.25	0.5	11	20	0	0	1	0	0	0	0	0	
Montlake R.S.	115	42	560	15	6.3	100	6.3	100	35.7	400	7000	0.33	0.067	0.25	0.02	5	3	20	0	0.93	0.07	0	0	0	0	
Montlake R.S.	116	26	860	21	5.46	100	5.46	100	20.54	400	4800	0.35	0.067	0.25	0.02	5	3	0	0	1	0	0	0	0	0	
Montlake R.S.	117	15.2	920	22	3.344	100	3.344	100	11.856	400	1700	0.35	0.067	0.25	0.02	5	3	0	0	1	0	0	0	0	0	
Montlake R.S.	118	10.9	800	21	2.289	100	2.289	100	8.611	400	2400	0.335	0.067	0.25	0.02	5	3	0	0	1	0	0	0	0	0	
Montlake R.S.	119	81	380	12	9.72	58	5.6376	40	28.512	400	12700	0.335	0.067	0.25	0.02	5	3	0	0	1	0	0	0	0	0	
Montlake R.S.	402	490.7	0	24	117.77	70	82.438	100	372.93	400	60000	0.33	0.067	0.25	5	5	20	0	0	1	0	0	0	0	0	
Subtotal		1,810			320	93	299	60	1,166																	

TABLE A-2													
1998 Runoff Basin Parameters													
Station	Basin ID	Size (acres)	ADW/F (%)	Imperv. Acres	Imp. Ac.	% Conn. Imperv.	Conn. Imperv.	Conn. Conn. Imperv.					
Bind Trunks													
E. Lee P.S.	102	47	750	15	6.3	30	1.89	0	0	400	4200	0.355	0.067
E. Lee P.S.	105	61	650	20	12.7	30	3.66	0	0	400	10800	0.32	0.067
E. Lee P.S.	107	132	910	25	33	30	9.9	0	0	400	21500	0.35	0.067
Subtotal		235		52	30	15	0						
E. Pine P.S.	96	113	490	11	12.43	30	3.729	0	0	400	17000	0.33	0.067
E. Pine P.S.	97	118	490	15	17.7	30	5.31	0	0	400	20900	0.32	0.067
E. Pine P.S.	99	77	650	14	10.76	30	3.234	0	0	400	21100	0.335	0.067
E. Pine P.S.	120	59	800	21	12.39	30	3.717	0	0	400	24500	0.34	0.067
Subtotal		367		63	30	16	0						
Univ. R.S.	16	243	600	20	48.6	5	2.43	0	0	400	25650	0.35	0.067
Univ. R.S.	17	201.1	600	33	58.363	5	3.182	0	0	400	23950	0.33	0.067
Univ. R.S.	18	110.4	600	29	32.016	5	1.6008	0	0	400	12100	0.3	0.067
Univ. R.S.	19	91.7	500	11	10.081	5	0.5044	0	0	400	12350	0.345	0.067
Univ. R.S.	20	234.2	500	28	85.576	5	3.2783	0	0	400	2700	0.32	0.067
Univ. R.S.	21	169	500	20	32.8	0	0	0	0	400	24280	0.34	0.067
Univ. R.S.	22	152	490	21	31.92	0	0	0	0	400	15030	0.343	0.067
Univ. R.S.	23	170.6	500	33	56.298	0	0	0	0	400	23550	0.345	0.067
Univ. R.S.	24	324.7	900	24.5	79.552	88	68.414	80	196.12	400	54650	0.348	0.067
Univ. R.S.	25	257.5	680	23	58.225	100	59.225	100	198.28	400	35500	0.33	0.067
Univ. R.S.	26	188.2	880	26	48.932	100	48.932	100	139.27	400	31100	0.335	0.067
Univ. R.S.	27	362.1	2000	30	108.63	100	108.63	100	253.47	400	43000	0.335	0.067
Univ. R.S.	28	68.8	600	30	20.64	0	0	0	0	400	11670	0.315	0.067
Univ. R.S.	29	146	760	25	36.5	100	36.5	100	109.5	400	22150	0.34	0.067
Univ. R.S.	30	263.7	600	17	44.829	100	44.829	100	218.87	400	39000	0.315	0.067
Univ. R.S.	31	113.6	900	22.4	25.446	100	25.446	100	69.154	400	12000	0.339	0.067
Univ. R.S.	32	203.1	800	23	46.713	100	46.713	100	156.39	400	35100	0.345	0.067
Univ. R.S.	33	269.4	780	20	53.88	100	53.88	100	215.52	400	36500	0.34	0.067
Univ. R.S.	34	108.7	740	21	23.031	100	23.037	100	88.683	400	20400	0.31	0.067
Univ. R.S.	35	18.5	0	95	18.525	100	18.525	100	16.525	400	3200	0.2	0.067
Univ. R.S.	78	253.7	680	25	63.425	100	63.425	100	190.28	400	42900	0.32	0.067
Univ. R.S.	84	148.4	770	22	32.848	100	115.75	100	32.848	400	25600	0.348	0.067
Univ. R.S.	121	61.5	1020	32	19.68	100	19.68	100	41.82	400	9400	0.345	0.067
Univ. R.S.	122	102	1000	34	3.468	100	3.468	100	6.792	400	3050	0.35	0.067
Univ. R.S.	123	66.3	1200	42	27.846	100	27.846	100	38.454	400	11200	0.335	0.067
Univ. R.S.	321	53.5	800	37.2	19.902	79	15.723	400	23.519	400	6314	0.335	0.067
Univ. R.S.	322	46.7	1200	24.5	11.442	51	5.8352	30	10.578	400	8840	0.34	0.067
Univ. R.S.	323	49.8	1200	29.5	14.691	72	10.574	60	21.005	400	9700	0.335	0.067
Univ. R.S.	398	78	830	24.5	18.11	100	18.11	100	58.68	400	10800	0.315	0.067
Univ. R.S.	403	285.7	0	25	71.425	100	71.425	100	214.28	400	4200	0.32	0.067
Univ. R.S.	404	488.7	0	28	136.84	100	136.84	100	351.86	400	31000	0.33	0.067
Univ. R.S.	405	276	0	92	253.92	100	253.92	100	22.08	11700	3300	0.33	0.067
Subtotal		4468		1377	68	1206	82	2759					
30th Ave. P.S.	81	275.3	770	25	58.825	35	24.089	0	0	400	47780	0.337	0.067
30th Ave. P.S.	82	186.9	760	25	46.725	35	16.554	50	60.605	400	34200	0.32	0.067
30th Ave. P.S.	85	142.6	520	15	21.39	65	13.904	50	12.904	400	20580	0.35	0.067
30th Ave. P.S.	86	163.1	1300	34	52.054	30	15.616	0	0	21700	32	0.02	0.067
30th Ave. P.S.	87	81.5	1050	62	50.53	30	15.159	400	6900	0.35	0.067	0.25	0.067
30th Ave. P.S.	88	155.1	810	26	40.326	35	14.114	0	0	400	26320	0.35	0.067
30th Ave. P.S.	89	101.4	810	26	28.364	35	9.274	0	0	400	17200	0.348	0.067

TABLE A-2

Stations and Trunks ID	Basin Size (acres)	ADWF	%	Impv.	% Conn.	Conn.	% Conn.	Conn.	1998 Runoff Basin Parameters						Rain Gauges:				
									Impv. Ac (sq mi)	Acres Impv.	Impv. Ac (sq mi)	Perv.	Perf.	Width (ft.)	Basin Leakage (sq mi)	Manning's Detention Coeff.	Soil Perm.	Suction Head (in.)	Rain Gauges:
30h Ave P.S.	91	70.8	17	12,002	30	0	0	400	13000	0.34	0.25	0.067	0.02	20	3	0	0	1	0
Subtotal	1,167	318	35	112	7	61													
Behoir P.S.	83	223.4	650	25	55.85	30	18,755	0	400	20000	0.35	0.02	0.25	0.02	20	2	0	1	0
Behoir P.S.	80	363.1	700	33	19,82	30	35,947	0	400	20000	0.348	0.02	0.25	0.025	17	2	3	0	0
Behoir P.S.	92	83.7	800	16	19,392	30	4,0176	0	400	16850	0.35	0.067	0.25	0.02	20	3	0	1	0
Behoir P.S.	93	111.2	800	21	23,352	30	7,0056	0	400	17650	0.35	0.067	0.25	0.02	20	3	0	1	0
Behoir P.S.	94	81.3	700	20	16,26	30	4,878	0	400	10550	0.35	0.067	0.25	0.02	20	2	3	0	0
Behoir P.S.	95	21.4	720	10	2,74	30	0.822	0	400	5500	0.34	0.067	0.25	0.02	20	3	0	1	0
Subtotal	890			231	30	69	0	0											
Lake City T.	77	86.9	670	22	21,098	100	21,098	100	400	14000	0.32	0.067	0.25	0.02	20	4	0	0	0
Lake City T.	79	240.4	840	20	49,09	100	49,09	100	400	39150	0.322	0.067	0.25	0.02	5	4	0	0	0
Lake City T.	80	81.8	770	22	17,986	100	17,986	100	400	15920	0.322	0.067	0.25	0.02	4	8	4	0	0
Subtotal	419			87	100	87	100	331											
Matt. Park P.S.	38	331.1	632	10	33,11	14	4,6354	20	59,598	544.1	37800	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	37	286.4	632	10	26,84	14	4,0376	20	51,912	544.1	41050	0.35	0.08	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	38	103.2	632	9	9,288	14	1,3003	20	18,762	544.1	8160	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	39	212.7	632	9	18,143	14	2,68	20	38,711	544.1	31370	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	40	162.2	632	10	16,22	14	2,20768	20	28,196	544.1	23550	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	41	344.9	632	14	48,288	14	6,76	20	59,323	544.1	48450	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	42	96.6	632	13	12,558	14	1,7581	20	18,806	544.1	17520	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	43	224.8	632	12	67.44	14	9,4416	20	31,472	544.1	13860	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	44	132.4	632	38	50,312	14	7,0437	20	16,418	544.1	15200	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	45	164.9	632	10	16,49	14	2,30866	20	28,682	816.1	19200	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	46	132.4	632	25	33.1	14	4,634	20	19,88	544.1	16800	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	47	277.4	632	10	27,74	14	3,8826	20	49,932	544.1	39800	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	48	120.7	632	12	14,484	14	2,0278	20	21,243	544.1	14110	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	49	348.2	632	12	41,794	14	5,8468	20	61,283	544.1	38250	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	50	288.8	632	20	57.76	14	8,0664	20	46,208	816.1	38000	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	51	150.1	632	11	20,811	14	2,9275	20	33,836	816.1	32200	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	52	232.4	632	19	44,156	14	6,1618	20	31,649	816.1	37900	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	53	104.1	632	25	26,025	14	3,6425	20	15,615	816.1	17450	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	54	317.1	632	21	66,591	14	9,3227	20	50,102	816.1	42200	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	55	146.8	632	11	16,126	14	2,2576	20	28,095	544.1	14650	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	56	333.1	632	22	73,282	14	10,259	20	51,984	816.1	48000	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	57	131.2	632	11	21,552	14	3,8573	20	27,73	816.1	24590	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	58	149.8	632	14	20,986	14	2,829	20	25,783	544.1	27050	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	59	134.7	632	14	16,853	14	2,6404	20	23,169	816.1	21590	0.35	0.09	0.01	0.175	0.03	2	1	0
Matt. Park P.S.	60	166	632	10	16,6	14	2,324	20	29,88	816.1	31000	0.35	0.09	0.01	0.175	0.03	2	0	0
Matt. Park P.S.	61	169.9	632	26	44,174	14	6,1944	20	25,145	544.1	21650	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	62	331	632	44	145.64	14	20,39	20	31,072	544.1	42120	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	63	287.9	632	17	48,843	14	6,852	20	47,791	816.1	57550	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	64	214.4	632	13	27,872	14	3,9021	20	37,306	816.1	23500	0.35	0.09	0.01	0.175	0.03	2	0	0
Matt. Park P.S.	65	108.7	632	12	13,044	14	1,8292	20	19,131	816.1	19700	0.35	0.09	0.01	0.175	0.03	2	0	0
Matt. Park P.S.	66	273.1	632	10	27.31	14	3,0224	20	49,159	816.1	40050	0.35	0.09	0.01	0.175	0.03	2	0	0
Matt. Park P.S.	67	169.9	632	21	35,679	14	1,9951	20	26,844	816.1	30000	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	68	207.2	632	18	37,286	14	5,2214	20	31,981	818.1	29500	0.35	0.09	0.01	0.175	0.03	2	4	0
Matt. Park P.S.	69	13.4	632	10	1,34	14	0,1816	20	2,412	186.1	3200	0.35	0.09	0.01	0.175	0.03	2	0	0
Matt. Park P.S.	70	87.9	632	20	17.58	0.5	0.0879	0	0	448	13200	0.35	0.09	0.01	0.175	0.03	1	0	0
Matt. Park P.S.	71	218.8	632	12	26,376	0.5	0.1319	0	0	448	31120	0.35	0.09	0.01	0.175	0.03	1	0	0

TABLE A.2

1896 Runoff Basin Parameters												
Stations and Trunks	Basin Size (acres)	ADWF (gpm)	% Impv.	Impv. Acres	% Conn. Impv.	Conn. Perv.	Conn. Impv. Ac Perv.					
Matt Park PS	72	126.8	632	17	21.556	0.5	0.1078	0	0.449	27950	0.35	0.09
Matt Park PS	73	98.4	632	9	8.856	0.5	0.0443	0	0	448	17850	0.35
Matt Park PS	74	104.8	632	10	10.46	0.5	0.0524	0	0	449	22500	0.35
Matt Park PS	75	88.2	632	10	8.62	0.5	0.0431	0	0	448	19450	0.35
Matt Park PS	76	154.8	632	12	18.576	0.5	0.0829	0	0	448	23650	0.35
Matt Park PS	358	612	562	134	92.008	0.5	0.41	0	358.4	151500	0.35	0.09
Matt Park PS	337	513	562	9	46.683	0.5	0.2334	0	0	358.4	50000	0.35
Matt Park PS	343	261	562	11	28.71	0.5	0.1438	0	0	175.2	18500	0.35
Matt Park PS	344	237	413	15	38.735	0.5	0.1837	0	0	175.2	33500	0.35
Matt Park PS	345	162	562	16	26.244	0.5	0.1312	0	0	175.2	12500	0.35
Matt Park PS	361	512.9	413	118	80.522	0.5	0.3026	0	0	320	58000	0.35
Matt Park PS	362	523	413	95	49.685	0.5	0.2484	0	0	320	73500	0.35
Matt Park PS	370	290	395	10	28	0.5	0.13	0	0	358.4	28400	0.35
Matt Park PS	371	286	657	9	26.01	0.5	0.1301	0	0	716.8	30600	0.35
Matt Park PS	386	200	632	20	40	0.5	0.2	0	0	448	31800	0.35
Subtotal:		11,358										
L. Ballinger PS	445	210.2	903	23	62.146	0.5	0.3107	0	0	120	36500	0.35
L. Ballinger PS	446	232.6	603	23	53.544	0.5	0.2675	0	0	120	33000	0.35
L. Ballinger PS	447	329.1	603	23	75.693	0.5	0.3785	0	0	120	53250	0.35
L. Ballinger PS	448	185.2	603	23	42.598	0.5	0.213	0	0	120	24750	0.35
L. Ballinger PS	449	325.4	603	23	74.842	0.5	0.3742	0	0	120	54750	0.35
L. Ballinger PS	450	103.7	603	23	23.851	0.5	0.1193	0	0	120	20000	0.35
L. Ballinger PS	451	342.6	603	23	78.798	0.5	0.394	0	0	120	48750	0.35
L. Ballinger PS	452	267.8	603	23	61.569	0.5	0.309	0	0	120	37000	0.35
Subtotal:		2,057										
Logboom RS	363	486	9.8	26.068	0.5	0.1903	0	0	268.8	25500	0.35	0.08
Logboom RS	384	486	27.8	74.762	0.5	0.3739	0	0	448	33500	0.35	0.09
Logboom RS	372	486	11.3	54.918	0.5	0.2246	0	0	192	53100	0.35	0.09
Logboom RS	373	536	782	7	37.52	0.5	0.1876	0	0	128	30200	0.35
Logboom RS	374	218	782	9	21.582	0.5	0.1079	0	0	192	23900	0.35
Subtotal:		1,715										
Kennmore PS	327	399	25.8	94.666	0.5	0.4734	0	0	39.9	13646	0.35	0.09
Kennmore PS	328	687	26.5	182.08	0.5	0.9103	0	0	39.9	55125	0.35	0.09
Kennmore PS	331	324	517	20.4	52.016	0.5	0.3101	0	0	51.7	36200	0.35
Kennmore PS	332	353	517	20	70.708	0.5	0.553	0	0	51.7	48800	0.35
Kennmore PS	333	473	517	27.2	128.66	0.5	0.633	0	0	51.7	55700	0.35
Kennmore PS	334	192	20.7	39.744	0.5	0.1887	0	0	36.2	28000	0.35	0.09
Kennmore PS	335	74	517	6.5	4.81	0.5	0.0241	0	0	51.7	9800	0.35
Kennmore PS	365	484	393	27.4	132.62	0.5	0.6831	0	0	39.3	53750	0.35
Kennmore PS	366	441	440	8.5	31.485	0.5	0.1874	0	0	36.0	44	0.35
Kennmore PS	367	249	440	10.2	25.398	0.5	0.127	0	0	44	19000	0.35
Kennmore PS	368	333	440	9	28.97	0.5	0.1499	0	0	44	38000	0.35
Kennmore PS	375	365	433	8	28.2	0.5	0.148	0	0	43.3	31100	0.35
Kennmore PS	376	161	433	31.2	52.104	0.5	0.2695	0	0	43.3	19600	0.35
Kennmore PS	377	758	433	9.7	73.526	0.5	0.3676	0	0	43.3	93350	0.35
Kennmore PS	378	149	433	17.5	28.075	0.5	0.1304	0	0	43.3	14900	0.35
Kennmore PS	379	552	433	8.8	48.576	0.5	0.2429	0	0	43.3	53700	0.35
Kennmore PS	380	514	433	11.6	59.624	0.5	0.2881	0	0	43.3	58840	0.35
Kennmore PS	381	392	433	11.9	46.648	0.5	0.2332	0	0	43.3	38100	0.35

TABLE A-2

1995 Runoff Basin Parameters

TABLE A-2																						
1998 Runoff Basin Parameters																						
Stations and Trunks	Basin ID	Size (acres)	ADWF (gpad)	% Imperv.	Imp. Acres	% Conn. Imperv.	Conn. Imp. Ac.	% Conn. Perv.	Conn. Perv. Ac.	Leakage (gpad)	Basin Width (ft.)	Mannings Perv.	Detention Perv. (in.)	Detention Perv. (in.)	Soil Perm (in./hr.)	Suction Head (in.)	Rain Gauges:					
																	RG1	RG2	RG3	THEIS1	THEIS2	THEIS3
Kenmore P.S.	382	145	433	23.5	34.075	0.5	0.1704	0	0	43.3	35300	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	383	74	433	32	23.68	0.5	0.1184	0	0	43.3	5800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	384	408	433	15.5	63.24	0.5	0.3162	0	0	43.3	19600	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	385	53	433	6.5	3.445	0.5	0.0172	0	0	43.3	4800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	397	151	517	8.1	12.231	0.5	0.0612	0	0	51.7	16580	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Kenmore P.S.	398	360	362	12.5	45	0.5	0.225	0	0	36.2	25200	0.35	0.08	0.01	0.175	0.03	2	0	0	1	0	0
	Subtotal			8,045			1,325	1	7	0	0											
Woodin. P.S.	329	748	161	33.5	250.56	0.5	1.2529	0	0	448	63479	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Woodin. P.S.	330	310	161	9.5	29.45	0.5	0.1473	0	0	18.1	3400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
	Subtotal			1,058			280	1	1	0	0											
Hollywood P.S.	346	451	363	6.3	28.413	0.5	0.1421	0	0	36.3	22000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	347	1147	363	6.3	72.261	0.5	0.3613	0	0	36.3	64000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	348	241	726	7.5	18.075	0.5	0.0904	0	0	72.6	12200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	349	682	824	9.8	88.436	0.5	0.4322	0	0	82.4	64800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	350	253	824	9	22.77	0.5	0.1139	0	0	82.4	19200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	351	238	824	10	23.8	0.5	0.119	0	0	82.4	17800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	352	665	824	38.3	254.7	0.5	1.2735	0	0	82.4	45600	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	353	530	726	36.5	193.45	0.5	0.9673	0	0	72.6	24000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	354	256	689	11.5	29.44	0.5	0.1472	0	0	68.9	27200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	355	488	689	9.7	47.336	0.5	0.2367	0	0	68.9	43200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	356	368	689	10.4	38.272	0.5	0.1914	0	0	68.9	33600	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	357	329	824	37.8	124.30	0.5	0.6218	0	0	82.4	14400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	358	368	689	40.5	149.04	0.5	0.7452	0	0	68.9	12800	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	359	209	689	7.5	15.675	0.5	0.0784	0	0	68.9	14400	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	360	744	689	12.2	90.768	0.5	0.4538	0	0	68.9	75200	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	369	302	733	11.6	35.032	0.5	0.1752	0	0	73.3	49920	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
Hollywood P.S.	400	748	733	10	74.8	0.5	0.374	0	0	73.3	128000	0.35	0.09	0.01	0.175	0.03	2	0	0	1	0	0
	Subtotal			6,219			1,305	1	7	0	0											
Interbay	151	145.3	680	16	23.246	30	6.9744	0	0	400	23200	0.335	0.067	0.25	20	5	12	0	0	1	0	0
Interbay	152	389.3	500	23	89.539	25	22.385	0	0	400	46870	0.34	0.017	0.25	1	15	12	0	0	1	0	0
Interbay	153	106.8	550	21	22.449	25	5.6123	0	0	400	21850	0.348	0.017	0.25	5	5	12	0	0	1	0	0
Interbay	154	106.7	480	25	28.675	25	6.6668	0	0	400	15500	0.35	0.017	0.25	0.1	18	12	0	0	1	0	0
Interbay	155	112.1	640	63	70.623	30	21.167	0	0	400	8260	0.338	0.067	0.25	10	8	12	0	0	1	0	0
Interbay	156	58.1	1000	59	33.099	30	9.9297	0	0	400	8160	0.154	0.067	0.25	15	5	12	0	0	1	0	0
Interbay	175	161	840	35	56.35	100	56.35	100	104.65	400	27300	0.275	0.067	0.25	0.02	20	11	12	0	0	0.94	0.06
Interbay	178	91	1500	73	66.43	100	66.43	100	24.57	400	21600	0.35	0.067	0.25	0.02	20	11	0	0	1	0	0
Interbay	179	86.7	17000	80	69.36	79	54.794	70	12.138	400	23500	0.1	0.087	0.25	0.02	20	11	20	0	0	0.95	0.05
Interbay	181	15	9000	80	12	72	8.64	60	1.6	400	4500	0.1	0.017	0.25	0.02	20	20	0	0	1	0	0
Interbay	182	7.1	600	93	6.603	100	6.603	100	0.497	400	1900	0.1	0.067	0.25	0.02	20	20	0	0	1	0	0
Interbay	199	53	400	76	40.28	15	8.042	0	0	400	4700	0.19	0.067	0.25	20	5	15	0	0	1	0	0
Interbay	202	47	1600	78	36.66	30	10.996	0	0	400	4000	0.1	0.067	0.25	25	4	15	0	0	1	0	0
	Subtotal			1,377			553	51	283	17	144											
Den. Loc. R.S.	176	211	1240	65	179.35	100	179.35	100	31.65	400	37000	0.35	0.067	0.25	0.02	20	11	0	0	1	0	0
Denny LU R.S.	177	222	1650	85	188.7	100	188.7	100	33.3	400	38200	0.35	0.035	0.25	0.02	20	11	0	0	1	0	0
Denny LU R.S.	190	95	900	28	26.6	100	26.6	100	68.4	400	19100	0.335	0.03	0.25	0.02	20	3	0	0	1	0	0
Denny LU R.S.	191	47	600	21	9.87	48	4.7376	25	9.2825	400	10400	0.335	0.03	0.25	0.02	20	3	0	0	1	0	0
Denny LU R.S.	192	37	1000	30	11.1	100	11.1	100	25.9	400	7200	0.32	0.03	0.25	0.02	20	3	0	0	1	0	0

TABLE A-2																	Rain Gauges:						
1996 Runoff Basin Parameters																	Head (in.)	RG1	RG2	RG3	THEIS1	THEIS2	THEIS3
Stations and Trunks	Basin ID	Size (acres)	ADW/F (gpad)	% Imperv.	% Conn. Acres	% Conn. Imperv.	Conn. Imp. Ac.	Conn. Perv.	Conn. Perv. Ac.	Leakage (gpad)	Basin Width (ft.)	Mannings Perv.	Detention imperv. (in.)	Detention Perv. (in.)	Soil Perm (in./hr.)	Suction Head (in.)	Rain Gauges:						
Denny LU R.S.	193	34	2200	27	9.18	100	9.18	100	24.82	400	6400	0.1	0.067	0.25	0.02	20	3	0	0	1	0	0	
Denny LU R.S.	194	63	4000	35	28.05	100	29.05	100	53.95	400	17700	0.32	0.067	0.25	0.02	20	3	0	0	1	0	0	
Denny LU R.S.	195	34	1000	13	4.42	100	4.42	100	29.58	400	5000	0.31	0.067	0.25	0.02	20	3	20	0	0.88	0.12	0	
Denny LU R.S.	196	125	640	20	25	100	25	100	400	23000	0.325	0.067	0.25	0.02	20	3	20	0	0.14	0.86	0		
Denny LU R.S.	197	98.7	1600	59	58.233	80	46.586	0	0	400	27800	0.325	0.067	0.25	0.02	20	3	11	20	0.04	0.53	0.43	
Denny LU R.S.	203	135	1100	75	101.25	100	101.25	100	33.75	400	22800	0.325	0.067	0.25	0.02	20	11	20	0	0.97	0.03	0	
Denny LU R.S.	204	88.6	1400	85	75.31	100	75.31	100	13.29	400	18400	0.35	0.067	0.25	0.02	20	11	20	0	0.52	0.47	0	
Denny LU R.S.	205	22	1200	81	17.82	100	17.82	100	4.18	400	3400	0.1	0.067	0.25	0.02	20	11	20	0	0.4	0.6	0	
Denny LU R.S.	206	316	3500	85	268.6	70	188.02	0	0	400	44600	0.345	0.01	0.25	0.02	20	20	0	0	1	0	0	
Denny LU R.S.	207	216	4400	85	183.6	70	128.52	0	0	400	33800	0.335	0.01	0.25	0.02	20	20	0	0	1	0	0	
		Subtotal					1,009	85	856	73	396												
King St. R.S.	180	141	10	80	112.8	86	97.008	80	22.56	400	23900	0.338	0.067	0.25	0.02	20	11	20	0	0.17	0.82	0	
Conn. St. R.S.	183	219	750	22	48.18	100	48.18	100	170.82	400	26400	0.325	0.034	0.25	0.2	20	15	20	0	0.04	0.98	0	
Conn. St. R.S.	184	92	2200	34	31.28	100	31.28	100	60.72	400	11000	0.1	0.034	0.25	0.2	20	15	20	0	0.1	0.9	0	
Conn. St. R.S.	185	228.2	1700	40	91.28	86	78.501	80	109.54	400	31300	0.35	0.067	0.25	0.2	20	15	20	0	0.1	0.9	0	
Conn. St. R.S.	186	165.8	1400	39	64.662	100	64.662	100	101.14	400	22700	0.19	0.067	0.25	0.2	20	15	20	0	0.59	0.41	0	
		Subtotal					235	95	223	94	442												
Lander #2 R.S.	187	216	1600	25	54	70	37.8	64	103.68	400	26600	0.293	0.02	0.25	20	5	15	20	0	0.93	0.07	0	
Lander #2 R.S.	188	93	1800	81	75.33	15	11.3	0	0	400	10300	0.1	0.067	0.25	20	5	15	0	0	1	0		
Lander #2 R.S.	189	34	1200	85	28.9	15	4.335	0	0	400	1300	0.1	0.067	0.25	20	5	15	0	0	1	0		
Lander #2 R.S.	200	72	800	93	66.96	15	10.044	0	0	400	4600	0.1	0.067	0.25	20	5	15	0	0	1	0		
Lander #2 R.S.	201	65.8	1500	78	51.324	15	7.6966	0	0	400	11400	0.11	0.067	0.25	20	5	15	0	0	1	0		
Lander #2 R.S.	208	142	900	28	39.76	30	11.928	0	0	400	23000	0.3	0.067	0.25	0.02	20	20	0	0	1	0	0	
Lander #2 R.S.	209	234	1030	24	56.18	30	16.848	0	0	400	41000	0.295	0.067	0.25	0.02	20	15	20	0	0	1	0	
Lander #2 R.S.	222	147	840	25	36.75	30	11.025	0	0	400	27400	0.345	0.067	0.25	0.02	20	15	20	0	0.01	0.99	0	
Lander #2 R.S.	223	128	900	28	35.84	100	35.84	100	92.16	400	20800	0.35	0.067	0.25	0.02	20	20	0	0	1	0	0	
Lander #2 R.S.	224	238	1260	28	66.64	44	29.322	20	34.272	400	33000	0.268	0.067	0.25	0.02	20	20	0	0	1	0	0	
Lander #2 R.S.	225	330	2920	38	125.4	100	125.4	100	204.6	400	48200	0.35	0.03	0.25	0.02	20	20	0	0	1	0	0	
Lander #2 R.S.	226	100	2380	51	51	30	15.3	0	0	400	14900	0.225	0.03	0.25	0.02	20	20	0	0	1	0	0	
Lander #2 R.S.	227	232	1860	32	74.24	37	27.469	10	15.776	400	39300	0.34	0.03	0.25	1	10	15	20	0	0.04	0.96	0	
Lander #2 R.S.	231	156	890	23	35.88	35	12.558	10	12.012	400	23400	0.35	0.067	0.25	0.02	20	20	0	0	1	0	0	
Lander #2 R.S.	407	216	0	25	54	30	16.2	38	58.32	400	26600	0.293	0.02	0.25	20	5	15	20	0	0.93	0.07	0	
Lander #2 R.S.	408	93	0	81	75.33	85	64.031	100	17.87	400	10300	0.1	0.067	0.25	20	5	15	0	0	1	0		
Lander #2 R.S.	409	34	0	85	28.9	85	24.565	100	5.1	400	1300	0.1	0.067	0.25	20	5	15	0	0	1	0		
Lander #2 R.S.	410	53	0	76	40.28	85	34.238	100	12.72	400	4700	0.19	0.067	0.25	20	5	15	0	0	1	0		
Lander #2 R.S.	411	72	0	93	66.96	85	56.916	100	5.04	400	4600	0.1	0.067	0.25	20	5	15	0	0	1	0		
Lander #2 R.S.	412	65.8	0	78	51.324	85	43.625	100	14.476	400	11400	0.11	0.067	0.25	20	5	15	0	0	1	0		
		Subtotal					1,115	53	506	36	576												
Hanford#2 R.S.	217	338	880	24	81.12	87.5	70.98	85	218.35	400	36500	0.31	0.067	0.25	0.02	20	15	18	20	0.32	0.01	0.67	
Hanford#2 R.S.	218	218	860	21	45.78	35	16.023	10	17.222	400	40700	0.345	0.067	0.25	0.02	20	18	20	0	0.79	0.21	0	
Hanford#2 R.S.	219	144.2	480	15	21.63	65	14.06	50	61.285	400	13000	0.345	0.067	0.25	0.02	20	15	20	0	0.89	0.01	0	
Hanford#2 R.S.	220	230	3000	27	62.1	45	27.945	10	16.79	400	32100	0.308	0.067	0.25	0.001	4	15	0	0	1	0	0	
Hanford#2 R.S.	221	37	2800	60	22.2	100	22.2	100	14.8	400	3600	0.065	0.067	0.25	0.001	4	15	0	0	1	0	0	
Hanford#2 R.S.	228	22	2800	70	15.4	100	15.4	100	6.8	400	10000	0.065	0.067	0.25	0.001	4	15	0	0	1	0	0	
Hanford#2 R.S.	229	38	2800	70	26.6	100	26.6	100	11.4	400	3500	0.065	0.067	0.25	0.001	4	15	0	0	1	0	0	
Hanford#2 R.S.	230	148	2800	65	96.2	84	80.808	80	41.44	400	15000	0.065	0.067	0.25	0.001	4	15	0	0	1	0	0	
		Subtotal					1,175	371	74	274	48	388											

TABLE A-2																							
1996 Runoff Basin Parameters																							
Stations and Trunks	Basin ID	Size (acres)	ADWF (gpad)	% Imperv.	Imp. Acres	% Conn. Imperv.	Conn. Imper. Ac	% Conn. Perv.	Conn. Perv. Ac	Leakage (gpad)	Width (ft.)	Basin Perv.	Mannings	Detention Imperv. (in)	Detention Perv. (in)	Soil Perm (in/hr.)	Suction Head (in.)	Rain Gauges: RG1	RG2	RG3	THEIS1	THEIS2	THEIS3
Rainier P.S.	210	279	530	16	44.64	35	15.624	10	23.436	400	41200	0.34	0.067	0.25	0.02	20	18	0	0	1	0	0	
Rainier P.S.	211	123	1280	32	39.36	35	13.776	10	8.354	400	27000	0.245	0.067	0.25	0.02	20	18	0	0	1	0	0	
Rainier P.S.	212	66	780	10.3	6.708	35	2.3793	10	5.9202	400	13700	0.34	0.067	0.25	0.02	20	18	0	0	1	0	0	
Rainier P.S.	213	237	860	14	33.18	35	11.613	10	20.382	400	41200	0.345	0.067	0.25	0.02	20	18	0	0	1	0	0	
Rainier P.S.	214	313	1040	25	78.25	35	27.388	10	23.475	400	52800	0.335	0.03	0.25	0.02	20	18	0	0	1	0	0	
Rainier P.S.	215	252	800	22	55.44	49	27.166	30	58.988	400	28200	0.335	0.03	0.25	0.001	20	15	16	18	0.23	0.05	0.72	
Rainier P.S.	216	101	660	20	20.2	70	14.14	60	48.48	400	16900	0.1	0.03	0.25	0.001	20	18	0	0	1	0	0	
Subtotal		1,371			278	40	112	17	189														
E. Duwamish	241	51.6	3600	60	30.98	100	30.98	100	20.84	400	7000	0.03	0.067	0.25	10	7	15	0	0	1	0	0	
E. Duwamish	242	235	500	45	105.75	8	8.46	0	0	400	15700	0.065	0.067	0.25	10	7	15	0	0	1	0	0	
E. Duwamish	243	165	500	40	68	15	9.9	0	0	400	6700	0.03	0.067	0.25	10	7	15	0	0	1	0	0	
E. Duwamish	244	400	200	25	100	20	20	0	0	400	31800	0.138	0.067	0.25	1	3	15	0	0	1	0	0	
Subtotal		852			303	23	69	4	21														
Brandon R.S.	281	67.1	3200	56	37.578	100	37.578	100	29.524	400	10600	0.19	0.067	0.25	10	7	15	0	0	1	0	0	
Brandon R.S.	282	63.8	3400	61	38.918	100	38.918	100	24.882	400	10400	0.094	0.067	0.25	10	7	15	0	0	0.78	0.22	0	
Brandon R.S.	283	63.8	2400	61	38.918	93	36.194	90	22.394	400	5600	0.03	0.067	0.25	10	7	15	16	0	0.22	0.78	0	
Subtotal		195			115	98	113	97	77														
Michigan R.S.	236	128	400	42.6	54.528	10	5.4528	0	0	400	20400	0.308	0.067	0.25	0.5	2	15	18	0	0.63	0.37	0	
Michigan R.S.	237	70.7	600	75	53.025	0	0	0	0	400	6800	0.082	0.067	0.25	10	7	18	0	0	1	0	0	
Michigan R.S.	238	278.8	710	29	80.784	100	80.794	100	197.81	400	42800	0.31	0.067	0.25	0.02	20	15	16	18	0.02	0.98	0	
Michigan R.S.	239	26.4	2200	60	15.84	100	15.84	100	10.56	400	4800	0.065	0.067	0.25	10	7	16	0	0	1	0	0	
Michigan R.S.	240	49.8	2600	64	31.872	100	31.872	100	17.928	400	7000	0.19	0.067	0.25	1	15	16	0	0	1	0	0	
Michigan R.S.	259	172.1	570	24	41.304	100	41.304	100	130.8	400	26200	0.325	0.04	0.25	0.02	20	15	16	0	0.73	0.27	0	
Michigan R.S.	260	22.5	1100	46	10.35	100	10.35	100	12.15	400	5200	0.254	0.067	0.25	10	7	18	0	0	1	0	0	
Michigan R.S.	269	73.1	3400	74	54.094	0	0	0	0	400	7200	0.03	0.067	0.25	10	7	15	16	0	0.2	0.8	0	
Michigan R.S.	270	44.6	1060	39	17.394	100	17.394	100	27.208	400	8400	0.275	0.067	0.25	10	7	18	0	0	1	0	0	
Michigan R.S.	271	57.1	2300	51	29.121	100	29.121	100	27.979	400	9100	0.208	0.067	0.25	10	7	15	16	0	0.42	0.58	0	
Michigan R.S.	272	45.8	3200	71	32.518	100	32.518	100	13.282	400	3200	0.065	0.04	0.25	10	7	15	16	0	0.35	0.65	0	
Michigan R.S.	273	40.5	3800	70	28.35	100	28.35	100	12.15	400	6800	0.03	0.067	0.25	10	7	16	0	0	1	0	0	
Michigan R.S.	413	73.1	0	74	54.094	100	54.094	100	19.006	0	7200	0.03	0.067	0.25	10	7	15	16	0	0.2	0.8	0	
Subtotal		1,009			449	77	347	84	463														
E. Marg. P.S.	246	159.7	2300	78.8	125.84	79	99.416	70	23.699	400	14500	0.065	0.067	0.25	10	7	16	0	0	1	0	0	
E. Marg. P.S.	247	371	2200	77.8	288.64	37	108.8	10	8.2362	400	18800	0.065	0.067	0.25	10	7	16	0	0	1	0	0	
E. Marg. P.S.	261	106.2	3200	63	68.906	86	57.539	80	31.435	400	14400	0.03	0.067	0.25	10	7	16	0	0	1	0	0	
Subtotal		637			481	55	264	41	63														
Norfolk R.S.	234	55.9	680	23	12.857	30	3.8571	0	0	400	8600	0.293	0.067	0.25	0.08	18	10	18	0	0.91	0.09	0	
Norfolk R.S.	235	140	500	25	35	56.2	19.67	56.2	59.01	500	19300	0.35	0.01	0.01	0.03	2	18	0	0	1	0	0	
Norfolk R.S.	253	229	500	25	57.25	56.2	32.175	56.2	96.524	500	33100	0.35	0.01	0.01	0.03	2	16	18	0	0	1	0	
Norfolk R.S.	254	262	500	25	65.5	56.2	36.811	56.2	110.43	500	41800	0.35	0.01	0.01	0.03	2	16	18	0	0.18	0.82	0	
Norfolk R.S.	255	155	500	25	38.75	56.2	21.778	56.2	65.333	500	22000	0.35	0.01	0.01	0.03	2	16	18	0	0	0.02	0.98	
Norfolk R.S.	256	145	500	25	36.25	56.2	20.373	56.2	61.118	500	20400	0.35	0.01	0.01	0.03	2	16	18	0	0	0	0	
Norfolk R.S.	257	340	1000	20	68	30	20.4	0	0	400	55800	0.345	0.067	0.25	0.02	20	18	0	0	1	0	0	
Norfolk R.S.	258	24.4	907.2	28.1	6.8584	30	2.0569	0	0	400	3200	0.35	0.067	0.25	0.02	20	18	0	0	1	0	0	
Norfolk R.S.	262	156.1	740	28.8	44.957	100	44.957	100	111.14	400	13800	0.308	0.067	0.25	0.5	10	10	16	18	0.98	0	0.01	
Norfolk R.S.	265	124.2	491.4	15	18.63	30	5.589	0	0	400	18700	0.345	0.067	0.25	0.03	19	10	0	0	1	0	0	
Norfolk R.S.	266	237	447.3	16	37.92	51	19.399	30	59.724	400	29700	0.335	0.067	0.25	0.04	19	10	18	0	0	1	0	
Norfolk R.S.	267	262.8	453.6	11	28.908	100	28.908	100	233.89	400	34850	0.345	0.067	0.25	0.25	10	2	10	0	0	1	0	

TABLE A-2																	
1990 Runoff Basin Parameters															Rain Gauges:		
Stations and Trunks	Basin ID	Size (acres)	ADWF %	Imperv. (gpm)	Conn. % Conn.	Conn. Imperv. Ac.	Conn. Imperv. Ac.	Conn. Perv. Ac.	Conn. Leakage (gpm)	Basin Width (ft.)	Manning's Perv. Inv.	Detriv. Inv.	Soil Perm. (in./hr.)	Suction Head (in.)	Rain Gauges:		
Norfolk R.S.	268	67.48	28	67.48	93	62.758	90	156.17	400	13200	0.261	0.25	0.5	10	THE(S1 THE(S2 THE(S3		
Norfolk R.S.	241	1520	7	2.31	100	30.68	400	4000	400	0.32	0.067	0.25	10	0	0		
Norfolk R.S.	33	320	9	12.762	100	12.762	100	129.04	400	3325	0.335	0.25	10	7	0		
Norfolk R.S.	275	141.8	62	528.2	20	12.4	30	3.72	0	400	0.335	0.067	0.25	20	18		
Norfolk R.S.	276	522.9	21	12.6	30	3.78	0	0	400	8500	0.345	0.067	0.25	20	18		
Norfolk R.S.	277	60	23	20.7	30	6.21	0	0	400	14200	0.34	0.067	0.25	20	18		
Norfolk R.S.	278	90	600	20	28.8	0	0	400	21800	0.345	0.067	0.25	20	18			
Norfolk R.S.	279	144	500	25	22	56.2	37.092	500	12700	0.35	0.01	0.01	2	18			
Norfolk R.S.	280	88	560	20.5	56.375	0	0	400	38500	0.33	0.067	0.25	0.02	10	0		
Norfolk R.S.	393	184	560	14	25.76	0	0	400	32750	0.33	0.067	0.25	0.02	20	18		
Norfolk R.S.	395	109.7	640	13.4	14.7	0	0	400	28000	0.345	0.067	0.25	0.02	20	18		
Norfolk R.S.	437	221.2	700	57	127.79	0	0	400	11500	0.015	0.015	0.25	12	7	10		
Subtotal		3,784			855	43	368	39	1,150								
Henderson P.S.	232	272.5	453.6	10	27.25	30	8.175	0	0	400	48500	0.31	0.067	0.25	20	18	
Henderson P.S.	233	178	510.3	20	35.6	30	10.88	0	0	400	19400	0.345	0.067	0.25	17	18	
Henderson P.S.	283	119	504	21	24.99	30	7.497	0	0	400	24500	0.345	0.067	0.25	20	18	
Henderson P.S.	253	322.4	12	30.36	44	13.358	20	44.526	400	32500	0.32	0.067	0.25	20	18		
Henderson P.S.	406	186.8	491.4	15	29.49	30	8.847	0	0	400	29500	0.345	0.067	0.25	19	10	
Subtotal		1,019			148	33	49	5	45								
W. Duwamish	284	232	3200	61	141.52	30	42.456	0	0	400	16200	0.03	0.067	0.25	0.02	20	18
W. Duwamish	285	158	3800	68	107.44	30	32.232	0	0	400	13600	0.03	0.067	0.25	0.01	7	14
W. Duwamish	287	56	2000	69	38.64	30	11.592	0	0	400	2600	0.03	0.067	0.25	0.02	20	15
W. Duwamish	289	59	1700	37	21.83	79	17.246	70	28.019	400	9200	0.31	0.067	0.25	0.02	20	15
W. Duwamish	290	164	560	14	22.96	5	1.71	30	42.312	400	21600	0.31	0.067	0.25	0.02	20	15
W. Duwamish	291	252	1400	43	108.36	44	3.6698	20	28.728	400	4800	0.315	0.067	0.25	1	1	15
W. Duwamish	292	104	240	8	8.32	44	3.6698	20	19.136	400	2400	0.31	0.067	0.25	1	1	15
W. Duwamish	298	25	2800	54	13.5	30	4.05	0	0	400	3400	0.1	0.067	0.25	0.02	20	15
Subtotal		1,050			463	37	171	20	116								
Chehal R.S.	286	319	2040	55	175.45	30	52.635	0	0	400	16800	0.2	0.067	0.25	0.02	20	14
Chehal R.S.	288	85	2040	44	37.4	50	21.692	40	19.04	400	13600	0.215	0.067	0.25	0.02	20	14
Chehal R.S.	310	71	450	17	12.07	100	24.507	0	0	400	10700	0.315	0.067	0.25	5	14	15
Chehal R.S.	311	220	800	23	50.6	48	24.288	25	42.35	400	17500	0.33	0.067	0.25	0.02	20	14
Chehal R.S.	312	208	440	17	35.53	100	35.53	100	173.41	400	15500	0.31	0.067	0.25	3	5	15
Chehal R.S.	313	159	600	29	46.11	30	13.853	0	0	400	21500	0.31	0.067	0.25	4	6	15
Chehal R.S.	314	30	600	21	6.3	100	23.7	400	400	0.315	0.067	0.25	0.02	20	5	15	
Chehal R.S.	315	389	450	21	81.69	30	24.507	0	0	400	49200	0.335	0.067	0.25	1	9	5
Chehal R.S.	316	94.5	325	23	21.735	65	14.128	50	36.383	400	17200	0.335	0.067	0.25	5	17	17
Chehal R.S.	317	188	450	16	30.08	30	9.024	0	0	400	31500	0.365	0.067	0.25	0.03	18	15
Chehal R.S.	318	121	450	20	24.2	100	24.2	100	98.8	400	18100	0.31	0.067	0.25	0.06	18	17
Chehal R.S.	319	193	650	20	36.6	90	34.74	85.7	132.32	400	27900	0.36	0.02	0.25	0.02	20	17
Chehal R.S.	320	47	520	20	9.4	100	9.4	100	37.6	400	80000	0.325	0.067	0.25	5	15	17
Subtotal		2,126			569	50	282	40	621						0.3	0.7	0
Harbor R.S.	308	144.3	740	19	27.417	100	116.88	400	22700	0.305	0.067	0.25	20	8	14	0	0
Harbor R.S.	309	312.6	1200	32	100.03	100	103.03	100	212.57	400	49700	0.1	0.067	0.25	5	5	14
Subtidal	457			127	100	127	100	329								0	0
W. Mich. R.S.	293	170	840	19	32.3	30	9.89	0	0	400	31000	0.35	0.067	0.25	25	4	17
Subtotal		W. Mich. R.S.	293														

TABLE A-2

1996 Runoff Basin Parameters

Stations and Trunks	Basin ID	Size (acres)	ADWF (gpm)	% Imperv.	Imp. Acres	% Conn. Imperv.	Conn. Imp. Ac.	% Conn. Perv.	Conn. Perv. Ac.	Leakage (gpm)	Basin Width (ft.)	Mannings Perv.	Detention Imperv. (in.)	Detention Perv. (in.)	Soil Perm (in./hr)	Suction Head (in.)	Rain Gauges: RG1 RG2 RG3 THEIS1 THEIS2 THEIS3
W. Marg. P.S.	294	9	2400	32	2.88	100	2.88	100	6.12	400	1000	0.11	0.067	0.25	0.02	20	16 0 0 1 0 0
W. Marg. P.S.	297	50	3040	58	29	65	18.85	50	10.5	400	4500	0.21	0.067	0.25	1	8 16 17 0 0.19 0.81	
W. Marg. P.S.	299	17	600	16	2.72	0	0	0	0	400	3400	0.325	0.067	0.25	40	2 16 17 0 0.2 0.8	
W. Marg. P.S.	300	60	700	10	6	0	0	0	0	400	12400	0.285	0.067	0.25	40	2 17 0 0 1 0	
W. Marg. P.S.	301	50	3600	62	31	100	19	100	9200	9200	0.126	0.067	0.25	0.02	20	16 17 0 0.93 0.07 0	
W. Marg. P.S.	302	40	3600	62	24.8	86	21.328	80	12.18	400	8600	0.03	0.067	0.25	0.02	20	16 0 0 1 0 0
W. Marg. P.S.	303	19	3360	52	9.88	51	5.0368	30	2.736	400	2800	0.03	0.067	0.25	0.02	20	16 0 0 1 0 0
W. Marg. P.S.	304	21	3000	45	9.45	65	6.1425	50	5.775	400	2400	0.03	0.067	0.25	0.02	20	16 0 0 1 0 0
W. Marg. P.S.	306	58	530	9	5.22	0	0	0	0	400	9700	0.305	0.067	0.25	40	2 17 0 0 1 0	
W. Marg. P.S.	307	147.5	1000	37	54.575	10	5.4575	0	0	400	13300	0.285	0.067	0.25	1	7 16 17 0 0.67 0.33 0	
W. Marg. P.S.	390	495	1330	20.2	69.99	0	0	0	0	400	42200	0.24	0.067	0.25	0.02	20	17 0 0 1 0 0
W. Marg. P.S.	391	329	860	16.1	52.969	0	0	0	0	400	47200	0.32	0.067	0.25	0.02	20	17 0 0 1 0 0
W. Marg. P.S.	392	530.3	860	11.9	63.108	0	0	0	0	400	65800	0.32	0.067	0.25	0.02	20	17 0 0 1 0 0
W. Marg. P.S.	401	116.5	1387	25	29.125	0	0	0	0	400	23600	0.035	0.067	0.25	0.02	20	17 0 0 1 0 0
Subtotal		1,942			421	22	91	4	56								
8th Ave. S. R.S.	295	143	1660	29	41.47	40	18.588	35	35.536	400	15400	0.275	0.067	0.25	0.5	14 16 0 0 1 0 0	
8th Ave. S. R.S.	296	20	3360	54	10.8	50	5.4	50	4.6	400	2200	0.1	0.067	0.25	0.02	20	16 0 0 1 0 0
8th Ave. S. R.S.	305	205	920	22	45.1	50	22.55	50	79.95	400	50000	0.335	0.05	0.25	0.005	7 16 17 0 0.55 0.45 0	
Subtotal		368			97	46	45	44	120								
63rd Ave. P.S.	422	89.5	480	15	13.425	42	5.6385	20	15.215	400	15950	0.32	0.03	0.25	0.03	2 5 14 0 0.15 0.85 0	
63rd Ave. P.S.	424	171.5	1230	25	42.875	30	12.863	0	0	400	24350	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
63rd Ave. P.S.	425	223.3	800	21	46.893	30	14.068	0	0	400	32725	0.35	0.03	0.25	0.03	2 5 14 0 0.03 0.97 0	
63rd Ave. P.S.	426	34.6	800	21	7.266	42	3.0517	20	5.4668	400	7500	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
63rd Ave. P.S.	427	24	800	21	5.04	72	3.6288	60	11.378	400	4075	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
63rd Ave. P.S.	428	114.7	680	26	29.822	42	12.525	20	16.976	400	20950	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
63rd Ave. P.S.	429	203.6	850	27	54.972	42	23.088	20	29.726	400	33800	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
63rd Ave. P.S.	430	253.5	800	21	53.235	30	15.971	0	0	400	40075	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
Subtotal		1,115			254	36	91	8	79								
53rd Ave. P.S.	431	57.6	750	22	12.672	42	5.3222	20	8.9856	400	9625	0.3425	0.03	0.25	0.03	2 14 0 0 1 0 0	
53rd Ave. P.S.	432	220.9	910	23	50.807	30	15.242	0	0	400	37200	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
53rd Ave. P.S.	433	64.3	430	17	10.931	72	7.8703	60	32.021	400	5800	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
53rd Ave. P.S.	434	29.9	940	31	9.269	72	6.6737	60	12.379	400	3150	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
53rd Ave. P.S.	435	161.7	920	24	38.808	30	11.842	0	0	400	27450	0.35	0.03	0.25	0.03	2 14 0 0 1 0 0	
53rd Ave. P.S.	436	293	620	17	49.81	42	20.92	20	48.638	400	43725	0.335	0.03	0.25	0.03	2 14 0 0 1 0 0	
Subtotal		827			172	39	68	16	102								
Murray P.S.	419	316.2	800	21	66.402	30	19.921	0	0	400	46450	0.35	0.03	0.25	0.03	2 5 14 15 0.57 0.41 0.02	
Murray P.S.	420	343.7	840	22	75.614	30	22.684	0	0	400	55700	0.35	0.03	0.25	0.03	2 5 0 0 1 0 0	
Murray P.S.	421	281.4	940	23	64.722	30	19.417	0	0	400	42100	0.35	0.03	0.25	0.03	2 5 14 0 0.63 0.37 0	
Murray P.S.	423	18.6	630	23	4.278	100	4.278	100	14.322	400	4950	0.35	0.03	0.25	0.03	2 5 0 0 1 0 0	
Subtotal		980			211	31	66	2	14								
Barton P.S.	414	244.8	840	20	48.96	86	42.106	80	156.67	400	45300	0.325	0.03	0.25	0.03	2 5 0 0 1 0 0	
Barton P.S.	415	73.7	700	13.3	9.8021	100	9.8021	100	63.898	400	13575	0.3	0.03	0.25	0.03	2 5 0 0 1 0 0	
Barton P.S.	416	325.3	850	22	71.566	65	46.518	50	126.87	400	48975	0.35	0.03	0.25	0.03	2 5 0 0 1 0 0	
Barton P.S.	417	194.6	600	17	33.082	72	23.819	60	96.911	400	27290	0.35	0.03	0.25	0.03	2 5 0 0 1 0 0	
Barton P.S.	418	227.8	810	22	50.116	30	15.035	0	0	400	40700	0.35	0.03	0.25	0.03	2 5 0 0 1 0 0	
Subtotal		1,066			214	64	137	52	444								

Table A-3
Baseline Simulation Results

Storm 1									
	Reported	LOCAL		AUTO		LOCAL		AUTO	
Station	Overflow (MG)	Hyd. Model	CATAD						
8th Ave.	2.88	2.66	2.31	7.03	6.07	2.72	2.54	6.75	6.43
W. Michigan	0.97	0.00		0.00		0.00		0	
Harbor	8.77	6.68		6.68		6.68		6.68	
Chelan	5.00	19.64	16.68	25.21	22.33	19.26	16.02	24.03	21.32
Norfolk	0.13	10.44	9.84	10.44	9.97	10.44	9.84	10.39	9.97
Michigan	50.37	27.82	24.41	27.67	24.39	28.94	25.46	27.25	23.97
Brandon	4.62	8.87	8.06	8.98	8.18	8.93	8.11	8.89	8.05
Hanford #1	113.82	0.00		0.00		0.00		0	
Hanford #2	0.00	84.61	78.41	87.12	80.49	83.78	81.54	84.25	81.54
Lander #1	35.00	24.39	41.13	24.35	41.51	24.31	41.26	24.21	41.23
Connecticut	17.00	20.26	17.81	20.31	17.81	19.79	17.40	19.24	16.99
King	9.05	5.10	6.24	10.41	13.42	5.17	6.47	9.91	12.31
DennyLocal	10.00	12.02	10.56	11.78	12.23	12.10	10.65	11.66	11.98
DennyLKU	52.26	53.83	51.31	45.07	46.38	54.13	51.68	47.15	49.19
Interbay	0.00	0.34	0.61	0.00	0.00	0.33	0.59	0	0.00
Duwamish P.S.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dexter	1.63	0.03	0.00	0.03	0.00	0.03	0.01	0.04	0.01
Canal St.	0.00	0.38	0.40	0.32	0.84	0.70	0.72	0	1.53
University	46.12	40.65	36.69	39.56	39.09	35.01	31.83	37.42	33.50
Montlake	2.84	2.95	2.93	2.91	2.96	3.03	3.14	3.03	3.15
Ballard	4.15	28.91	31.29	28.76	32.73	30.75	39.87	37.56	48.70
11th Ave NW		1.72		1.65		0.75		0.72	
3rd Ave. W.		37.84		35.02		40.97		27.18	
MLK Way		19.9		19.9		19.9		19.9	
Murray PS		0		0		0		0	
Barton PS		0.17		0.17		0.17		0.17	
Beach Dr.		0.5		0.5		0.5		0.5	
63rd Ave PS		11.91		11.91		11.91		11.91	
Total	364.6	421.6	338.7	425.8	358.4	420.3	347.1	418.8	369.9
Total- CATAD	354.9	342.9	338.7	350.0	358.4	339.4	347.1	351.8	369.9

Table A-3 (cont.)									
Baseline Simulation Results									
Storm 2									
Reported	LOCAL		AUTO		LOCAL		AUTO		
Overflow	Uncorrected Levels		Uncorrected Levels		Corrected Levels		Corrected Levels		
Station	(MG)	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD
8th Ave.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W. Michigan	0.00	0.00		0.00		0.00		0.00	
Harbor	0.20	0.14		0.14		0.14		0.14	
Chelan	0.00	0.02	0.00	0.22	0.34	0.02	0.00	0.23	0.34
Norfolk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Michigan	1.45	0.43	0.35	0.56	0.13	1.30	1.13	0.68	0.56
Brandon	0.00	0.15	0.14	0.26	0.17	0.14	0.14	0.29	0.26
Hanford #1	6.99	0.00		0.00		0.00		0.00	
Hanford #2	0.00	0.19	0.16	1.30	1.56	0.00	0.00	0.60	0.58
Lander #1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connecticut	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
King	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DennyLocal	0.55	0.54	0.51	0.38	0.39	0.56	0.52	0.38	0.41
DennyLKU	2.04	2.06	1.95	0.27	0.31	1.73	1.85	0.34	0.53
Interbay	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Duwamish P.S.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dexter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canal St.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
University	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montlake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ballard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11th Ave NW		0.00		0		0.00		0.00	
3rd Ave. W.		0.00		0		0.00		0.00	
MLK Way		0		0		0		0	
Murray PS		0		0		0		0	
Barton PS		0		0		0		0	
Beach Dr.		0		0		0		0	
63rd Ave PS		0.00		0.00		0.00		0.00	
Total	11.2	3.5	3.1	3.1	2.9	3.9	3.6	2.7	2.7
Total- CATAD	11.0	3.4	3.1	3.0	2.9	3.8	3.6	2.5	2.7

Table A-3 (cont.)									
Baseline Simulation Results									
Storm 3									
	Reported	LOCAL		AUTO		LOCAL		AUTO	
Station	Overflow	Uncorrected Levels		Uncorrected Levels		Corrected Levels		Corrected Levels	
	(MG)	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD
8th Ave.	0.00	0.00	0.00	0.21	0.16	0.00	0.00	0.21	0.19
W. Michigan	0.00	0.00		0.00		0.00		0.00	
Harbor	0.58	1.17		1.17		1.17		1.17	
Chelan	0.21	1.78	1.79	2.85	3.04	2.12	2.12	2.45	2.33
Norfolk	0.00	1.19	1.22	1.19	1.22	1.22	1.22	1.20	1.22
Michigan	1.68	2.87	2.91	2.87	2.92	3.65	3.72	2.91	2.93
Brandon	0.00	1.15	1.10	1.08	1.04	1.11	1.14	1.18	1.13
Hanford #1	5.67	0.00		0.00				0.00	
Hanford #2	0.00	6.34	6.13	9.13	8.33	6.37	5.89	6.45	6.10
Lander #1	0.04	2.09	3.43	1.66	2.78	3.45	3.27	2.20	3.69
Connecticut	0.60	1.65	1.25	1.84	1.69	1.12	1.01	1.66	1.03
King	0.54	0.28	0.45	1.00	1.34	0.50	0.46	0.96	1.33
DennyLocal	0.59	1.48	1.55	1.03	1.02	1.51	1.36	1.24	1.33
DennyLKU	2.66	7.43	6.98	3.64	3.10	6.57	6.05	4.74	4.13
Interbay	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
Duwamish P.S.	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
Dexter	1.37	0.34	1.21	0.34	1.21	1.21	1.21	0.34	1.21
Canal St.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
University	0.63	0.72	0.61	0.72	0.66	0.00	0.00	0.00	0.00
Montlake	0.14	0.11	0.09	0.11	0.09	0.25	0.25	0.17	0.16
Ballard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	1.32
11th Ave NW		0.00		0.00		0		0.00	
3rd Ave. W.		0.99		0.80		1.37		0.48	
MLK Way		1.56		1.56		1.56		1.56	
Murray PS		0.22		0.22		0.22		0.22	
Barton PS		0.22		0.22		0.22		0.22	
Beach Dr.		0.32		0.32		0.32		0.32	
63rd Ave PS		1.63		1.63		1.63		1.63	
Total	14.7	33.5	28.7	33.6	28.6	35.6	27.7	32.3	28.1
Total- CATAD	14.1	27.4	28.7	27.7	28.6	29.1	27.7	26.7	28.1

Table A-3 (cont.)

Baseline Simulation Results

Storm 4

Station	(MG)	Reported LOCAL		AUTO		Reported LOCAL		AUTO	
		Overflow Uncorrected Levels		Uncorrected Levels		Corrected Levels		Corrected Levels	
		Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD
8th Ave.	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W. Michigan	0.00	0.00		0.00		0.00		0.00	
Harbor	0.71	1.69		1.69		1.69		1.69	
Chelan	1.25	2.58	2.22	4.58	4.25	2.49	2.15	4.29	4.09
Norfolk	0.00	0.80	0.67	0.80	0.73	0.80	0.67	0.79	0.73
Michigan	6.00	4.91	4.39	4.68	4.28	5.83	5.18	4.53	4.17
Brandon	0.52	1.39	1.28	1.54	1.41	1.44	1.32	1.51	1.38
Hanford #1	0.00	0.00		0.00		0.00		0.00	
Hanford #2	8.64	9.62	9.18	10.83	10.09	9.46	9.37	9.31	9.12
Lander #1	5.81	2.37	4.21	2.26	3.60	2.35	3.91	2.47	4.38
Connecticut	1.13	2.20	1.99	2.36	2.00	1.81	1.60	1.97	1.79
King	1.14	0.00	0.00	1.41	1.70	0.00	0.00	1.38	1.75
Denny Local	1.32	2.36	2.39	2.23	2.29	2.36	2.39	2.25	2.45
Denny LKU	9.12	8.56	8.09	6.54	6.27	8.83	8.38	7.04	7.34
Interbay	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Duwamish P.S.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dexter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canal St.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
University	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montlake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ballard	0.26	2.19	2.11	2.24	2.51	2.44	3.17	3.54	4.60
11th Ave NW		0.02		0.02		0.00		0.00	
3rd Ave. W.		3.58		2.80		4.00		1.22	
MLK Way		0.04		0.04		0.04		0.04	
Murray PS		0		0		0		0	
Barton PS		0.08		0.08		0.08		0.08	
Beach Dr.		0.17		0.17		0.17		0.17	
63rd Ave PS		1.14		1.14		1.14		1.14	
Total	36.3	43.7	36.5	45.4	39.1	44.9	38.1	43.4	41.8
Total-CATAD	35.6	37.0	36.5	39.5	39.1	37.8	38.1	39.1	41.8

Table A-3 (cont.)									
Baseline Simulation Results									
Storm 5									
	Reported	LOCAL		AUTO		LOCAL		AUTO	
Station	Overflow	Uncorrected Levels	CATAD	Uncorrected Levels	CATAD	Uncorrected Levels	CATAD	Corrected Levels	Corrected Levels
	(MG)	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD
8th Ave.	0.00	0.38	0.34	1.61	1.26	0.41	0.40	1.50	1.37
W. Michigan	0.02	0.00		0.00		0.00		0.00	
Harbor	2.12	3.30		3.30		3.30		3.30	
Chelan	3.08	6.28	5.34	8.17	7.48	6.10	5.46	8.42	7.63
Norfolk	0.00	3.50	3.31	3.50	3.30	3.50	3.31	3.53	3.30
Michigan	15.00	9.07	8.13	9.16	8.25	10.53	9.30	9.08	8.10
Brandon	1.82	3.18	2.85	3.37	3.06	3.13	2.83	3.36	3.04
Hanford #1	0.00	0.00		0.00		0.00		0.00	
Hanford #2	24.64	24.19	22.65	26.83	24.86	23.23	22.59	24.47	23.60
Lander #1	11.23	7.02	11.73	7.18	12.07	7.60	12.64	8.08	13.71
Connecticut	4.83	6.05	5.37	5.69	4.96	5.20	4.55	5.63	4.84
King	3.48	1.02	1.32	2.99	3.77	1.00	1.30	3.28	4.11
Denny Local	2.72	4.76	4.24	4.18	4.19	4.74	4.22	4.47	4.48
Denny LKU	12.21	18.18	17.28	14.68	15.04	17.61	16.74	14.78	14.93
Interbay	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Duwamish P.S.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dexter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canal St.	0.00	0.00	0.00	0.00	0.05	0.02	0.02	0.00	0.07
University	5.35	6.20	5.75	5.82	6.21	4.58	4.53	4.04	4.14
Montlake	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ballard	0.39	6.19	6.45	6.40	7.32	6.60	8.57	8.15	10.48
11th Ave NW		0.11		0.11		0.00		0.00	
3rd Ave. W.		10.23		9.38		11.22		5.98	
MLK Way		5.33		5.33		5.33		5.33	
Murray PS		0.21		0.21		0.21		0.21	
Barton PS		0.33		0.33		0.33		0.33	
Beach Dr.		0.89		0.89		0.89		0.89	
63rd Ave PS		7.30		7.30		7.30		7.30	
Total	87.3	123.7	94.8	126.4	101.8	122.8	96.4	122.1	103.8
Total- CATAD	85.1	96.0	94.8	99.6	101.8	94.3	96.4	98.8	103.8

Table A-3 (cont.)									
Baseline Simulation Results									
	Reported LOCAL			AUTO		Reported LOCAL		AUTO	
	Overflow Uncorrected Levels			Uncorrected Levels		Corrected Levels		Corrected Levels	
Station	(MG)	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD
8th Ave.	0.27	0.88	0.68	2.08	1.80	0.90	0.86	2.04	2.03
W. Michigan	0.10			0.00		0.00	0.00	0.00	0.00
Harbor	2.88	3.36		3.36		3.36	0.00	3.36	0.00
Chelan	1.15	7.37	5.99	12.07	10.71	7.13	6.25	11.83	10.61
Norfolk	0.01	3.82	3.71	3.87	3.60	3.87	3.71	3.82	3.60
Michigan	12.95	12.78	11.02	12.71	11.00	13.36	11.28	12.63	10.99
Brandon	2.86	4.28	3.81	4.47	4.00	4.38	3.93	4.46	4.00
Hanford #1	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hanford #2	40.00	37.18	34.49	37.84	35.01	37.16	36.09	36.80	35.80
Lander #1	16.00	10.69	17.95	10.56	17.98	11.00	18.47	11.54	20.21
Connecticut	6.00	9.36	8.25	9.39	8.15	8.64	7.69	8.90	7.83
King	2.74	1.31	1.69	4.80	5.90	1.39	1.66	4.65	6.07
DennyLocal	5.00	6.41	5.70	6.12	6.37	6.47	5.87	6.19	6.38
DennyLKU	24.84	26.99	25.83	21.18	21.92	26.70	25.29	21.98	22.15
Interbay	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Duwamish P.S.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dexter	1.62	0.37	0.84	0.38	0.85	0.34	0.80	0.35	0.80
Canal St.	0.00	0.00	0.01	0.00	0.14	0.06	0.07	0.00	0.16
University	9.16	12.62	11.00	10.25	12.11	8.54	8.62	8.65	8.58
Montlake	0.61	1.26	1.33	1.28	1.31	1.29	1.24	1.31	1.35
Ballard	0.61	10.06	10.26	9.54	10.97	10.40	13.63	13.20	17.10
11th Ave NW		0.38	0.00	0.40	0.00	0.08	0.00	0.08	0.00
3rd Ave. W.		10.74	0.00	12.84	0.00	15.18	0.00	8.75	0.00
MLK Way		6.18		6.18		6.18		6.18	
Murray PS		0.55		0.55		0.55		0.55	
Barton PS		0.6		0.6		0.6		0.6	
Beach Dr.		0.66		0.66		0.66		0.66	
63rd Ave PS		5.78		5.78		5.78	0.00	5.78	
Total	130.4	173.6	142.6	176.9	151.8	174.0	145.5	174.3	157.7
Total- CATAD	127.5	145.4	142.6	146.5	151.8	141.6	145.5	148.4	157.7

Table A-3 (cont.)									
Baseline Simulation Results									
Storm 7									
	Reported	LOCAL		AUTO		LOCAL		AUTO	
Station	Overflow	Uncorrected Levels		Uncorrected Levels		Corrected Levels		Corrected Levels	
	(MG)	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD
8th Ave.	3.26	5.40	4.92	6.76	5.80	5.39	5.09	6.49	6.08
W. Michigan	0.891	0.00		0.00		0.00		0.00	
Harbor	11.64	6.56		6.56		6.56		6.56	
Chelan	6.52	11.19	12.98	14.32	12.63	11.03	9.39	13.04	11.89
Norfolk	0.351	11.30	10.70	11.30	10.83	11.30	10.70	11.32	10.83
Michigan	34.00	25.67	23.55	26.18	23.94	29.31	26.58	26.49	24.12
Brandon	8.16	7.35	6.78	7.49	6.90	7.37	6.70	7.64	6.99
Hanford #1	57.14	0.00		0.00		0.00		0.00	
Hanford #2	25.851	58.79	53.60	71.29	65.081	55.41	52.96	59.95	57.20
Lander #1	25.00	19.30	32.05	19.20	32.26	19.28	32.12	19.86	33.25
Connecticut	16.00	16.26	14.03	15.21	13.53	14.64	12.74	15.34	13.46
King	11.131	6.58	7.92	8.12	9.861	6.71	8.00	8.97	10.96
Denny Local	9.31	10.07	8.68	9.53	8.66	10.59	9.15	10.67	10.42
Denny LKU	52.16	49.86	46.46	33.96	28.75	48.83	45.63	35.54	32.01
Interbay	4.23	4.55	14.84	4.74	15.85	4.58	14.92	5.22	17.77
Duwamish P.S.	0.00	0.35	0.00	0.33	0.00	0.00	0.00	0.00	0.00
Dexter	20.96	2.24	7.55	2.27	7.74	2.28	7.87	2.33	8.06
Canal St.	0.00	2.46	2.29	2.54	3.86	3.32	3.10	0.00	4.82
University	68.751	65.81	57.86	65.72	60.571	62.94	59.75	62.83	60.72
Montlake	3.54	11.85	12.80	11.78	12.94	12.21	13.09	12.23	13.27
Ballard	2.48	23.20	27.53	23.28	28.73	25.70	33.60	31.26	41.09
11th Ave NW		5.14		5.02		3.39		3.41	
3rd Ave. W.		35.10		34.29		36.09		28.88	
MLK Way		21.4		21.4		21.4		21.4	
Murray PS		1.49		1.49		1.49		1.49	
Barton PS		1.74		1.74		1.74		1.74	
Beach Dr.		2.8		2.8		2.8		2.8	
63rd Ave PS		20.80		20.80		20.80		20.80	
Total	361.4	427.3	344.5	428.1	347.9	425.2	351.4	416.3	363.0
Total- CATAD	348.8	331.9	344.5	333.7	347.9	330.9	351.4	329.2	363.0

Table A-3 (cont.)						
Baseline Simulation Results						
1982 Annualized Overflow Volumes (MG)						
Simulations						
'88 CSO	Annualized	LOCAL	LOCAL	AUTO	AUTO	
Plan	Reported	Uncorr. Levels	Uncorr. Levels	Uncorr. Levels	Uncorr. Levels	
Baseline	CATAD	Hyd. Model	CATAD	Hyd. Model	CATAD	
Station	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)
8th Ave.	15	10.2	11.5	10.0	26.4	22.1
W. Michigan	2	2.3	0.0	0.0	0.0	0.0
Harbor	55	48.1	57.9	0.0	57.9	0.0
Chelan	25	37.0	107.2	95.9	161.5	151.4
Norfolk	4	0.5	59.4	56.4	59.5	56.8
Michigan	250	253.1	185.6	167.4	185.9	164.4
Brandon	35	30.1	60.4	55.3	63.9	57.7
Hanford #1		330.9	0.0	0.0	0.0	0.0
Hanford #2	680	271.0	453.1	424.0	525.1	489.3
Lander #1	215	187.4	130.9	220.8	126.7	212.4
Connecticut	90	79.1	112.1	97.4	112.8	98.9
King	70	52.7	20.8	26.6	60.5	75.9
DennyLocal		64.0	92.7	86.7	82.5	83.3
DennyLKU	370	332.3	390.0	369.4	269.1	262.6
Interbay		5.5	4.7	14.8	4.5	15.1
Duwamish P.S.	130	0.0	0.3	0.0	0.3	0.0
Dexter	12	15.1	3.0	9.5	3.0	9.6
Canal St.	10	0.0	0.6	0.7	0.6	1.7
University	211	98.6	104.0	93.4	96.6	100.6
Montlake	40	6.9	7.3	7.4	7.3	7.4
Ballard	90	8.1	85.2	89.4	85.2	97.5
11th Ave NW		0.0	3.6	0.0	3.5	0.0
3rd Ave. W.	105	0.0	124.8	0.0	118.7	0.0
MLK Way			88.1		88.1	
Murray PS			5.1		5.1	
Barton PS			6.7		6.7	
Beach Dr.			11.7		11.7	
63rd Ave PS			93.6		93.6	
Total	2409.00	1833.1	2220.4	1825.0	2256.8	1906.7
Total- CATAD	2117.00	1782.7	1828.6	1825.0	1871.1	1906.7

Table A-3 (cont.)				
	Baseline Simulation Results			
	1982 Annualized Overflow Volumes (MG)			
Simulations				
LOCAL	LOCAL	AUTO	AUTO	
Corr. Levels	Corr. Levels	Corr. Levels	Corr. Levels	
Hyd. Model	CATAD	Hyd. Model	CATAD	
Station	(MG)	(MG)	(MG)	(MG)
8th Ave.	11.7	11.1	25.4	24.0
W. Michigan	0.0	0.0	0.0	0.0
Harbor	57.9	0.0	57.9	0.0
Chelan	107.3	94.7	153.8	142.9
Norfolk	59.7	56.4	59.4	56.8
Michigan	222.0	199.3	185.9	168.4
Brandon	60.5	56.0	64.8	59.2
Hanford #1	50.2	298.2	0.0	0.0
Hanford #2	419.1	282.9	457.6	442.0
Lander #1	125.7	129.3	138.4	237.4
Connecticut	93.2	45.1	105.7	89.7
King	30.8	69.4	60.8	77.5
Denny Local	133.8	277.8	86.4	89.8
Denny LKU	335.6	113.6	289.0	289.1
Interbay	4.7	14.9	5.0	16.9
Duwamish P.S.	0.0	0.0	0.0	0.0
Dexter	0.9	9.8	3.0	9.5
Canal St.	1.3	58.4	0.0	2.7
University	80.2	21.4	78.9	75.1
Montlake	6.9	95.0	7.9	8.1
Ballard	90.6	26.7	119.5	154.9
11th Ave NW	1.3	0.0	1.2	0.0
3rd Ave. W.	144.6	0.0	80.4	0.0
MLK Way	88.1		88.1	
Murray PS	5.1		5.1	
Barton PS	6.7		6.7	
Beach Dr.	11.7		11.7	
63rd Ave PS	93.6		93.6	
Total	2243.3	1860.0	2186.2	1944.2
Total- CATAD	1834.3	1860.0	1841.5	1944.2

Table A-4
City of Seattle Storage Projects

ID. #	Facility	Year Const.	Location	Equipment	Capacity (1000 gallons)
1	524 feet of 96-inch RCP	1983	Longfellow Creek - 24th Ave. SW at SW Webster St.	Hydrobrake	197
2	100 foot diameter x 27 foot tall, concrete tank CSO-168	1982	Longfellow Creek - SW Orchard St. and Delridge Way SW	Hydrobrake Instrumentation Electrical	1586
3	100 foot diameter x 27 foot tall, concrete tank CSO-169	1982	Longfellow Creek - SW Henderson St. and 22nd Ave. SW	Hydrobrake Instrumentation Electrical	1586
4	346 feet of 72-inch, 835 feet of 84-inch RCP	1986	Rainier Ave. S from S Perry St. to S Cooper St.	Hydrobrake Electrical	314
5	241 feet of 72-inch, 913 feet of 24-inch RCP	1986	Rainier Avenue - Seward Park Ave. S to 52nd Ave. S	Hydrobrake Electrical	72
6	110 feet of 60-inch RCP	1986	Seward Park Ave. S, north of S Henderson St.	Hydrobrake	16
7	Gate and raised weir to make use of storage in 2950 feet of existing 78-inch pipe	1986	S Henderson St. at Rainier Ave. S	Slide plate at a fixed setting	360
8	100 feet of 84-inch, 168 feet of 72-inch RCP	1986	Seward Park - Lake Washington Blvd. S, south of S Juneau St.	Hydrobrake Electrical	64
9	66 feet of 144-inch RCP	1986	Lake Washington Blvd. at S Alaska St.	Hydrobrake	56
10	Two 65-foot long, 54-inch parallel RCPs	1986	S Snoqualmie St. at 52nd Ave. S	Hydrobrake	15
11	217 feet of 84-inch RCP	1986	S Dakota St. and 49th Ave. S	Hydrobrake	63
12	2525 feet, of 72-inch pipe. Flow control chamber	1987	Lake Washington Blvd. at 44th Ave. S	Hydrobrake	534
13	1765 feet of 16-inch iron pipe	1987	Service Road off Lake Washington Blvd. at Coleman Park	Hydrobrake	18
14	56 feet of 72-inch RCP	1987	Lakeside Ave. S at I-90	Hydrobrake	12
15	129 feet of 84-inch RCP	1987	Lakeside Ave. S at Parkland Place	Hydrobrake	37
16	164 feet of 30-inch RCP	1986	Lakeside Ave. S, south of S Lane St.	Hydrobrake	6
17	251 feet of 42-inch RCP	1986	Lake Washington Blvd., south of E James St.	Hydrobrake	18
18	307 feet of 18-inch RCP	1986	Lake Washington Blvd., south of E James St.	Hydrobrake	4
19	88 feet of 72-inch RCP	1987	51st Ave. NE and NE 38th St.	Hydrobrake	19

Table A-4 (continued)
City of Seattle Storage Projects

ID. #	Facility	Year Const.	Location	Equipment	Capacity (1000 gallons)
20	234 feet of 96-inch RCP	1987	50th Ave. NE between NE 42nd St. & NE 41st St.	Hydrobrake	88
21	150 feet of 72-inch RCP	1987	55th Ave. NE at NE 43rd St.	Hydrobrake	32
22	1307 feet of 18-inch, 134 feet of 30-inch RCP	1987	58th Ave. NE	Conveyance improvement only	
23	Two 591 foot long , 96-inch parallel RCP	1987	Sand Point Way NE between 55th Ave NE and NE 61st St.	Hydrobrake	444
24	Two 998 foot long, 144-inch parallel RCP	1987	39th Ave. NE and 40th Ave. NE	Hydrobrake	1689
25	749 feet of 72-inch RCP	1987	NE 41st St. and Surber Drive NE	Hydrobrake	158
26	550 feet of 72-inch RCP	1988	E Hamlin St. and Park Drive E		116
27	228 feet of 72-inch RCP	1987	Magnolia Blvd. W and W Armour St.	Hydrobrake	48
28	Flow control restrictor		Perkins Lane W and W Raye St.	Hydrobrake	
29	Flow control weir	1986	57th Ave. S and S Holly St.	Hydrobrake	
30	527 feet of 48-inch, 368 feet of 72-inch and 368 feet of 144-inch RCP CSO-068	1987	15th Ave. - W Boston St. and W Armour St.	Hydrobrakes	127 311
31	565 feet of 84-inch RCP CSO-099	1993	SW Hinds St - SW Andover St. and 26th Ave. SW	Hydrobrake	163
32	66x24x15 foot concrete tank CSO-111	1993	Diagonal Ave. S - 10th Ave. S at S Oregon St.	Hydrobrake	178
33	36 feet of 120-inch, 24 feet of 54-inch and Two 89 foot long, 132-inch parallel RCP CSO-138,140	1993	E Shelby St/Portage Bay - E Shelby St. at Boyer Ave. E and W Park Dr. E	Hydrobrakes	24 126

Note: Hydrobrakes are flow control devices. Telemetry equipment is planned for installation in the CSO detention facilities.

Source: City of Seattle, As-built Construction Drawings and the Combined Sewer Overflow Control Plan, 1988, prepared by Brown and Caldwell Consulting Engineers.

Table A-5
Summary of City of Seattle Separation Projects

<u>Project</u>	<u>Year</u>	<u>Location</u>	<u>Area of Separation (acres)</u>
CSO-068	1987	Interbay area	292
CSO-070	1990	Downtown Seattle	24
CSO-071	1990	Downtown Seattle	9
CSO-072	1991	Downtown Seattle	36
CSO-139	1990	Montlake area	32
CSO-111	1993	Diagonal Ave.	345
CSO-099	1993	Delridge Ave.	165
CSO-140	1993	Montlake area	16
CSO-138	1993	Montlake area (feeds Eastlake)	35

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Memo

April 14, 1994

To: Recipients of "Existing Combined Sewer Overflows for Metro's 5-Year CSO Plan Update"

From: Bob Swarner

Subject: Replacement Pages for CSO Technical Memorandum

Shortly after the "Existing Combined Sewer Overflows for Metro's 5-Year CSO Plan Update" technical memorandum was distributed last week, I discovered a programming error in Metro's hydraulic routing model. The error resulted in inflow data being placed in the wrong location for the 1996 conditions. The overflow volume estimates significantly affected are at the Hanford #2, Lander #2, Connecticut, King, Denny Local and Denny Lake Union Regulators and at 3rd Ave. West.

Enclosed are four replacement pages for the report which provide the corrected information. The net result is that Metro CSOs are reduced about 34-37% from the 1981-83 baseline by 1996, instead of the 39-44 % as reported previously. Some regulator stations have increased overflow volumes and some have decreased overflow volumes in this latest update. I sincerely apologize for any inconvenience this may have caused you.

With regard to alternatives specific to Denny Way and the Duwamish basin, it should be noted that the Denny Way treatment facility as presented in the Denny Way CSO Workshop on April 8, 1994 will not be affected by these changes. The storage required in a Denny Way storage option, however, is increased by about 10 million gallons, (31%). The Duwamish secondary and CSO treatment plant information presented at the workshop is affected only by the associated storage required along the EBI.

Feel free to contact me if you have any questions regarding this corrected information. Thank you for your cooperation in replacing the pages in the report.



Municipality of Metropolitan Seattle
Exchange Building • 821 Second Ave. • Seattle, WA 98104-1598

March 7, 1994

TO: Distribution List

FROM: Susan Rosenberg *SR*

SUBJECT: Existing Combined Sewer Overflows for Metro's 5-Year CSO Plan Update

Attached for your review is the Existing Combined Sewer Overflows Report for Metro's 5-Year CSO Plan Update. If you have any questions or comments, please contact Bob Swarner at 684-2072 or Laura Wharton at 684-1240.

Attachment

cc: Laura Wharton
Bob Swarner